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## THE END OF THE FIRST SEMESTER

When this issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION reaches its readers, the end of the first semester will be close at hand. This means that one half of the school year is over, and that a certain definite part of the year's work has been covered. Some students will probably never have another opportunity to have contact with the work which they are now finishing. For others, this work must act as a foundation for studies that are to follow next semester and probably even next year. The question then arises, has the work been given efficiently — have the students who have just taken the course profited as much from the work as they should have? Applying the proper tests may disclose this, but the test results, if they are to serve best, must not be used merely as a basis for giving grades. If properly used, they will also disclose weaknesses that may exist in the course itself or in the way in which the course has been taught.

It is advisable, therefore, to make a thorough study of the test results. They may help to improve the work for the next semester very materially.

## AN IMPORTANT VIEWPOINT

Professor Arthur B. Mays of the University of Illinois, Urbana, Ill., outlines ably and well the position which industrial arts should occupy in the school curriculum.

Everyone interested in industrial arts, therefore, should read his article on page 35 of this issue.

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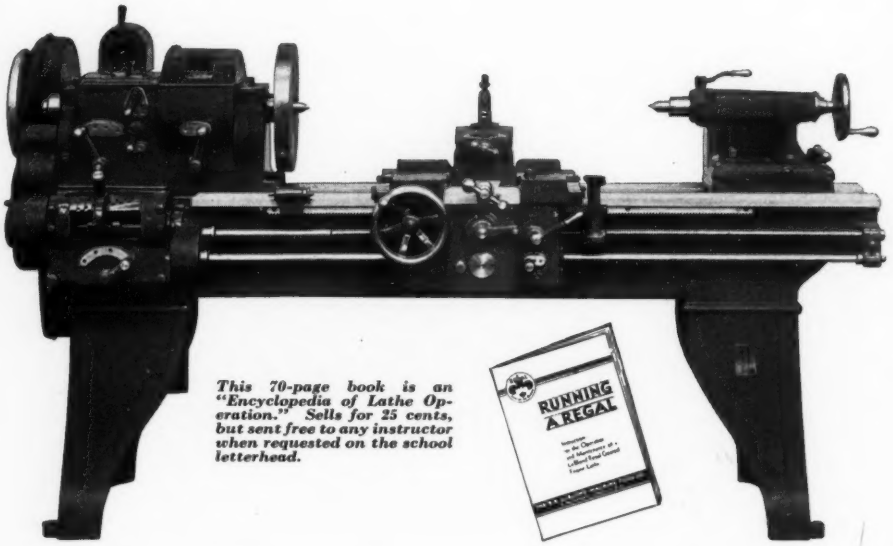




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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

February, 1937
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# Industrial Arts in the New Curriculum

## Arthur B. Mays

*Professor of Industrial Education,*
*University of Illinois, Urbana, Illinois*

*Considering the normal interests of youth, industrial-arts work serves better than social science as the integrating factor in modern education. (Author's address before the Wisconsin Industrial Arts Association.)*

There are great economic, political, and social movements afoot today which are leading toward revolutionary changes in organized education. The schools have always been slow to change and have been among the last of society's agencies to respond to new conditions of life in every age of history. Public attention seems always to focus upon the progress of education only after every other major aspect of civilized life has moved to new ground and the lag of the schools has become painfully obvious. It has been pointed out by historians that in 1870 there were fewer college students per million population in the United States than there were in 1830. In 1870 the industrial revolution was in full swing, great cities were rising, new industries were being created on every side, the habits and ambitions of the people had changed, the scale and modes of living were different, and the educational needs of youth were almost completely different; yet the schools and colleges of 1870 were identical in courses of study, methods, and organization with those of 1830. Out of that unhappy state of affairs urgently needed reforms were brought about and the schools almost caught step with the times. Repeatedly has such a phenomenon been observed in the history of education. Now again, America seems to have reached a point where great changes are about to occur in the schools. Once more it is hoped that they can be made more adequately to serve modern society.

### Depressions and the Schools

All major depressions have greatly affected the progress of the schools. Depressions always strike down schools. They are among the first institutions to be deprived of adequate support, and they are among the last social agencies to feel the revivifying effects of recovery. This means that schools are usually made to suffer longest of all the social institutions. Such treatment invariably results finally in the focusing of public attention on their plight, with the result that during the years immediately following all great depressions, schools have seasons of reform and unusual growth. This cycle of mistreatment and almost destructive deprivation, followed by a great change and expansion, is clearly discernible at least three times in American history, and it seems now that the second phase of a fourth similar cycle is about to appear. The public-school system was started on its first great forward movement following the depression of 1837. The high-school movement had its first great impetus after the depression of 1873. During the decade following that depression, manual training was introduced into the high school. After the depression of 1893, the modern high school was born with its several curriculums, its elective system, and greatly enlarged program. And once more, a new day is dawning for the schools following a terrible period of depression during which they were shamefully treated by a panic-stricken and short-sighted people.

There are new and momentous ideas permeating the educational thought of the present era of reform and expansion which were lacking in all earlier corresponding times. At long last, America is becoming deeply concerned with the problems of social welfare. All earlier educational reforms were dominated by a philosophy of individualism. "Put the whole boy to school" was Dr. Woodward's battlecry in the 1880's. "Individual differences" was the shibboleth of the 1890's and the early years of this century. Today, however, "social efficiency," "social intelligence," "social adjustment" are the watchwords. The difference is most significant. The reforms of the 1880's and the movements following 1893 were merely expansions and enrichments of the traditional school, but the new reforms confronting today's school call for a *fundamental revision* of the whole curriculum. Nothing short of that will answer modern needs. This is, indeed, a soul-stirring time in educational history and every teacher should be fully prepared to play his allotted part in the impending reorganizations.

At such a time, under such challenging conditions, what part should industrial arts play in the new curriculums which will eventually emerge from the maelstrom of new forces and new purposes now at work? This question cannot be answered until it is known what the character of the new curriculum is to be. It is too early now to predict with confidence, but there are at least two very distinct characteristics which may be expected to predominate, namely, (1) the organization of the new curriculum will be that of an *integration* of materials and experiences, and (2) the objective will be *social understanding and adjustment*. Some sort of effective integration of instructional materials and educational experiences constitutes the most obvious and most pressing need of the schools today. Just how this reorganization is to be achieved no one knows, but it must occur, and the integration must be a genuine, organic joining together in a real unity of materials and activities if the needed reform is to be wrought.

Integration means far more than correlation. It is not enough that the present unrelated blocks of subject matter be somehow related to one another. They must be completely reworked as parts of a unity which centers around some major factor in the experiences of boys and girls. Many are saying that the obvious center around which to build the unified curriculum is the social sciences. This, they say, is logical since the desired outcome of the educative process is social understanding and adjustment. But it is extremely doubtful whether anything more than an "academic" integration can be achieved in this manner. A sort of integration of materials can be made around almost any center, but whether a genuine unifying of understanding and experience in the lives of boys and girls will result when the social sciences are the unifying center of instruction is a very doubtful matter. A real and vital interest in the social studies is usually an acquired trait of

middle life and rarely belongs to youth. Youth builds its thinking and its experiencing around far different centers of interest. There has been a too ready acceptance of the social subjects as the basic factor in the unifying of the curriculum. It would seem to be more logical to assume that activities and subject matter which lie nearer to the normal interests of youth would be more effective centers for the integration of the school experiences. Hence, it appears that for many, if not for most, boys the industrial arts would be a far more desirable core subject for the new curriculum than any yet suggested. The making of useful things, the handling of tools and machines, the learning about the remarkable, fascinating mechanical forces and devices of contemporaneous life, these are already centers of deep interest before a boy enters school and they continue to attract his thoughts and stimulate his learning and activities throughout youth. There are few exceptions to this rule among today's boys. Hence, it is not unreasonable to conclude that the industrial-arts studies and activities should be brought in from the fringe of the curriculum very near to the center of the new curriculum if, indeed, they are not placed at the very center around which all the rest of the instruction is organized.

### Industrial Arts and Education

Industrial arts, then, should have a very important part in the new organization of teaching materials and activities. But, what place has it in the new emphasis upon social adjustment as a chief outcome of education? Dr. Woodward and the leaders of his day clearly were thinking in the terms of an educational philosophy of individualism. Much of the history of industrial-arts education has rested upon individualistic thought with reference to purposes, methods, and organization of instructional materials. Most of the earlier statements of values and objectives are perfectly sound today, but industrial arts need no longer rest its case upon, or chart its advances by, an educational philosophy of narrow individualism. There is no other subject division in the modern school more nearly related to the central facts of present-day life. The industrial revolution produced modern life; industry permeates all of it, and the problems of modern industry lie at the very base of all the social problems which are most typical of this age. The school activity which specifically represents industry surely has a large contribution to make to the social adjustment of modern youth. Industrial arts as a school subject was not handed down from ages past as a traditional subject of instruction, but came into the school directly from modern life and it, therefore, should have a major role in the adjusting of youth to a society which is dominated by the activities, the problems, and effects of modern industry. The writer has frequently been required in recent years to present a convicing statement to school and university authorities concerning the basic values and purposes of industrial arts as a phase of contemporaneous education. It has been found that the following statement is almost invariably accepted as fully satisfactory.

"The fundamental purpose, in final analysis, of all secondary education is to enable youth to understand and to deal effectively with his environment. Chemistry is taught in the high school not to make chemists, but to enable those who study it to understand the chemical aspects of their environment and to deal effectively with them for their own safety and comfort, and the welfare of others. Mathematics is taught not to make mathematicians, but to enable youth to understand and to deal effectively with the number aspects of modern life. In like manner, each of the high-school subjects of study is taught not to make specialists, but to make youth intelligent about, and the masters of, their environment, both for their own and the social good.

"But what is the most obtrusive and the most nearly ubiquitous factor in the contemporaneous environment? Quite obviously it is industry, its products, materials, processes, and problems. As one sits in a room, it usually may be said of him that everything in the room except his body, his personality, and the air he breathes are the direct products of industry. Frequently, his body, his personality, and the air he breathes are in some degree modified by industry. Therefore, it seems absurd to attempt to enable modern youth to understand and deal effectively with his environment unless a large place is given in the curriculum to a study of modern industry, its processes, its materials, its products, and problems. Such a study constitutes the subject matter of industrial arts." Rarely does such a statement fail fully to satisfy the query of a modern educator.

It seems clear, then, that industrial arts should play a leading part in any adequate curriculum reorganization which places emphasis upon integration of materials and activities and upon social understanding and adjustment. But are there changes which must be made in industrial arts itself before it can play such a role? There are weak places in the present forms of this school subject. In most schools, a far richer, broader, and more varied content is greatly needed. The very shop processes experienced by the pupils need enriching by more careful planning and a greater demand upon thought. Working without close thinking is not valuable education. Besides, the learning that goes on in the shop is not broad enough, nor is it sufficiently deep. Boys are not taught enough about the processes they perform. Much shop teaching is too superficial to be very valuable. Too much attention is not given to the question of *how* to do, but far too little is given to the matter of *why* it is done in a given way. Not only should the teaching be richer and broader, but more phases of modern industry should be taught in the shops and drawing rooms. Whole major divisions of modern industry are not represented in the schools by even a single activity. Furthermore, much higher standards of both craftsmanship and knowledge are almost universally needed in industrial-arts departments. The educative value of this work is great only when high standards of both knowledge and skill are demanded. All these shortcomings can easily be remedied by an aroused, alert teaching personnel. Great progress is already being made toward enrichment and enlargement of offerings. From every direction come reports of teachers' organizations, committees, and individuals working to make this division of schoolwork more nearly fit the needs of modern social and economic life. There must be no giving of ground in the struggle both for a richer, broader industrial arts, and for a larger more central place in the educational program of the nation. It must be more generally recognized as the subject most representative of the chief factor in present-day life, namely, modern industry.

The weaknesses of industrial arts obviously point to teacher defects. More teachers with a well-founded philosophy of education which comprehends industrial arts must be developed if this subjects plays its proper role in the days to come. This clearly implies broadly educated teachers, who understand the major movements in all modern education. There has been a remarkable improvement in the general level of both the academic and professional education among industrial-arts teachers during recent years. Their rapidly growing interest in graduate study and in the larger problems of general educaton is a heartening indication. The outlook is challenging and full of encouragement. The men and women who have devoted their lives to this great field of education must not fail in the tasks just ahead. The new curriculum is slowly taking form, and industrial arts is already assured an important position in it, but it will depend chiefly upon its leaders and teachers as to whether that position is the one it ought to occupy. The philosophy and trend of the best thought in modern education point clearly toward a new day of progress and social service for industrial arts.

# Vocational Guidance


## R. Randolph Karch

*Arsenal Junior High School,*
*Pittsburgh, Pennsylvania*


*The big job of the junior high school is to give its students real vocational guidance through its tryout courses.*

Under normal conditions, approximately one million boys and young men and one-half million girls and young women enter the various industries of the United States each year. These young people differ greatly in their preparation, intelligence, aptitudes, interests, temperament, emotional stability, physique, personality, and character traits.

According to Myers,[1] these young people must start to work in one of the many jobs offered by the 2,000 to 3,000 industries. Many do not know much about the jobs they enter. It is mere chance that most of them enter certain fields. There are some who are not physically or mentally fit to handle the work of their first choice. Many of these leave their first jobs, and then float from job to job trying to find exactly what they want to do in the working world.

From Trumbull's surveys,[2] we find that less than 26 per cent of these young people hold their jobs more than one year. Of the entire group taking part in a survey, more than 50 per cent were anxious to leave their present jobs and try something else. Of the 331 persons interviewed, a total number of jobs reported was 698. See the Table.

**Table Showing Number of Jobs Held by Term of Employment**

| | |
|---|---|
| Jobs held one year or longer | 26.1% |
| Jobs held six months or longer, but not two years | 23.2% |
| Jobs held three months or longer, but not six months | 28.6% |
| Jobs held less than three months | 22.1% |

School census reports for 1920 show that only two thirds of the young people in the United States from 5 to 20 years of age attended school. The curve of distribution began to drop at 12 and than sank sharply from the 13-year period. Fourteen per cent dropped out prior to 14 years of age, 27 per cent prior to 15 years of age, 51 per cent prior to 16 years of age, 70 per cent prior to 17 years of age, and 80 per cent prior to 18 years of age.

One cause for pupils dropping out of school at the median age of 15 is the economic pressure in the home. Another cause is mental dullness on the part of the pupil. There are other reasons — one of the commonest is that the student's interests have not been challenged by school activities.[3] Also, that he has never caught a vision of the possibilities for his own self-advancement along desired lines through school achievement.[4] According to Trumbull, fully one half of the school drop-outs merely drifted out of school to try something else.

An economic loss is suffered by all concerned as these junior wage earners shift from job to job in trying to find work that suits them, and work that they suit. A loss is suffered by the boy himself as he leaves advanced standing in one job and takes on a new apprenticeship in another. The employers who train him suffer another loss through the sometimes expensive training period given to new workers, and finally the public suffers a loss caused indirectly by this shifting of labor.

It has been pointed out that a certain class of students leave school because it has nothing more to offer them in the satisfaction of their needs. Since an economic loss is suffered by all concerned in this needless shifting about by the wage earner, a challenge is issued to the public schools to guide and train these young people vocationally. Authorities on vocational education have agreed on the following objectives:[5] To guide in choosing an occupation, to guide in preparing for an occupation, to guide in entering upon an occupation, and to guide in making progress in an occupation.

Inasmuch as the greatest number of school drop-outs are of adolescent, or junior-high-school age, it is important that the junior high school accept the challenge to aid in helping these young people to choose their lifework.

Jones[6] says that "By the nature of the case, most of the major problems of vocational guidance are located in the junior high school. This is true because the majority of pupils who leave school do so before the tenth grade is reached, and because curriculum choices that involve broad selections of occupations must be made at the beginning of the ninth grade or during the ninth year."

To guide properly vocationally, the junior high school's responsibility is to collect data on each student as to (1) personal facts — health, achievement, psychological educational test ratings, personal and family data; (2) facts from group and individual counseling; (3) vocational plans, and (4) special facts needed for the orientation of pupils.

In a case study quoted by Eikenberry,[7] it was found that many persons would not have entered a now disliked occupation had they the necessary information about this work before entering it. The junior wage earner leaves school with an accurate knowledge of occupations and with no habit of thinking about them except in a helpless way.[8] It would seem that the schools should give the opportunity to discover the entrance requirements for various occupations, and to get a general idea of the work through a course in occupations.

Exploration is the nature of all schoolwork. The adolescent explorer passes through consecutive stages on his journey of exploration during his junior-high-school years. First, he adjusts himself to his new environment that he may learn how most effectively to benefit by his exploratory experiences; second, he enters upon his exploratory activities; third, he makes a particular appeal to his individual interests; fourth, after the testing of his choice, he undertakes the initial stage of his differentiation into a curriculum group. When the foregoing steps have been taken, he is ready for specialized training of his choice in the senior high school.[9]

The drop-out student deserves exploratory experiences in the various fields of work in which he may take part. Many junior high schools today present exploratory courses in such subjects as carpentry and cabinetmaking, forge, foundry, ceramics, printing, automotives, machine-shop

[1] Myers, G. E., *The Problem of Vocational Guidance*, The Macmillan Company, New York, 1929, p. 6.

[2] Trumbull, F. M., *Guidance and Education of Prospective Junior Wage Earners*, John Wiley & Sons, New York, 1929, p. 49.

[3] Dewey, John, *Interest and Effort in Education*, Houghton Mifflin, New York, 1913, p. 93.

[4] Vaughn and Mays, *Content and Method of Industrial Arts*, The Century Company, New York, 1924.

[5] *Vocational Guidance in Secondary Education*, United States Bureau of Education Bulletin, Number 19, Government Printing Office, Washington, D. C., 1918, p. 9.

[6] Jones, A. J., *Principles of Guidance*, McGraw-Hill Book Company, New York, 1930, p. 54.

[7] Eikenberry, D. H., *An Introduction to Guidance*, Ohio State Department of Education, Columbus, Ohio, pp. 183, 184.

[8] Brewer, J. M., in Allen's *Practice of Vocational Guidance*, McGraw-Hill Book Company, New York, p. 39.

[9] National Association of Secondary School Principals, Committee on Guidance, *Guidance in Secondary Schools*, Bulletin 19, Cicero, Ill., 1928, p. 32.

practice, drafting, electricity, photography, bookbinding, and others.

Exploratory activities in the junior high school, however, should be in keeping with the major industries of the town in which the school is located. For example, ceramics would fit into the program of a junior high school in a china manufacturing center such as East Liverpool, Ohio. Likewise, printing would fit into the curriculum of a junior high school in a printing center such as Cincinnati, Ohio.

What objectives should be uppermost in the minds of junior-high-school shop teachers? Briggs[10] brings out a worthwhile thought along this line: "It was the tendency at first to teach too much subject matter and facts. The teachers, not being accustomed to teach directly about the activities of life, confined themselves to recorded tables and lists of vocations, but soon they began to see that the important thing was to allow the pupil to learn about these great fields of humanity by actually living in replica . . . producing something of value in the shop."

Let us see, through a case study in guidance, what part the junior high school can play in helping student drop-outs:

*Scene:* A typical city junior high school, with homogeneous grouping practiced through pupil achievement in all grades.

*Subject:* John, who wants to quit school and drive a truck for his father — a cement contractor. John is 16, and in the eighth grade. He is large for his age, and is failing in most of his school subjects. He is "dragging" several subjects, in which he is passing. Furthermore, he does not like school; he finds nothing in it that is interesting.

*Method:* The principal interests him in industrial-arts work, and he elects woodworking and printing. After a semester of work, he plans to take half a day of printing, spending the rest of his time in academic subjects.

He manifests a great interest in printing, coming to the shop every morning before school starts, after school, and at the noon recess. His grades in printing are all perfect; his grades in other subjects are either flat failures or barely making the passing mark. When taken to account for this, he claims that he tries hard in the academic courses, but cannot "get" them. He finishes the printing course in record time, and is interested in "going into business for himself." He is given a special vocational course in the printing department, and is finally the instructor's right-hand man.

Near the close of the year's work, he asks the instructor about the possibilities of his working at the trade. He is given the information asked for, and is instructed on how to apply for a job. He goes out, returns and says that the shop to which he applied has asked for references. The school people write to them, and the job is his, in a commercial printing plant in the city.

John returns at odd times to visit the school, and while there talks about how he "tells the other apprentices of higher standing how to do certain jobs." In the course of a year, he returns to tell that he must take a series of correspondence courses in printing to join the local union. John is aided in his correspondence work and in like problems.

Then came the Great Flop of 1929. John comes back. If he is laid off, he says, he will start a plant of his own, the capital being supplied by his father. His school advisers suggest that he study business methods, but they feel from past experiences with him that he could not be very successful in any other job than that of a printing mechanic, because: (1) he likes to work with his hands, to "follow" copy, and not to edit it; (2) his knowledge of English and grammar are below average, and he could not read proof intelligently; (3) he has little social contact outside of his own immediate family; (4) he knows practically nothing of the "business-getting" end of the printing trade, and is unwilling to study it.

His advisers, with this data in mind, advise him to stay in his work and if he is interested in a business of his own to study salesmanship, costs, and methods before launching out for himself. It is believed that if he enters business for himself, he could result in only another "price-cutting bedroom printer," and would ultimately become disgusted with his work and himself, possibly going back into some laboring job, such as driving the truck for his father.

[10]Briggs, E. S., *Exploration in the Junior High School*, Proceedings of the National Education Association, 65:665–7, 1927.

# Auto Mechanics vs. Automotive Service

## A. C. Goodrich

*Vocational School,*
*Waukesha, Wisconsin*

*In this article the author calls attention to the modern changes which are taking place in the automotive-service occupations which cannot be ignored by the school if it is to train young men for advantageous entry into the automotive-service field.*

In a brief span of years automobile manufacturing and servicing has developed from infancy to a monstrous giant that overshadows most other industries and occupations, both from the standpoint of capital investment and employment.

The extent to which this industry has developed may more readily be realized when one considers the following factors:

1. That it would be possible to transport the entire population of the United States at one time with the twenty-six million registered motor vehicles we have in our country.

2. That the manufacturing and servicing of automobiles provides one person out of every ten in the United States with a livelihood.

The economic need and demand for automotive transportation has resulted in the development of the greatly refined and highly complicated present-day motor car. This development has been so rapid and extensive in the past few years that service men have hardly been able to keep up with the gigantic strides set by automobile manufacturers.

The very fact that service men find it difficult to keep up with modern automotive improvements, places an increased obligation upon the school. This increased responsibility is one of training young workers to enter an occupation that is progressively changing from day to day. A training program for automotive service must be one that is flexible to the extent that it may be continually modified so as to keep in step with the latest service trends. In this respect it might be well for schoolmen to scrutinize modern automobiles, service equipment, and service shops in an effort to evaluate the school's automotive-service training program and shop.

The two cars shown at A and B in Figure 1, are indicative of the rapid strides which have been made in the development of the motor car in the past eight years. The striking contrast of the outside appearance of these two models is only a

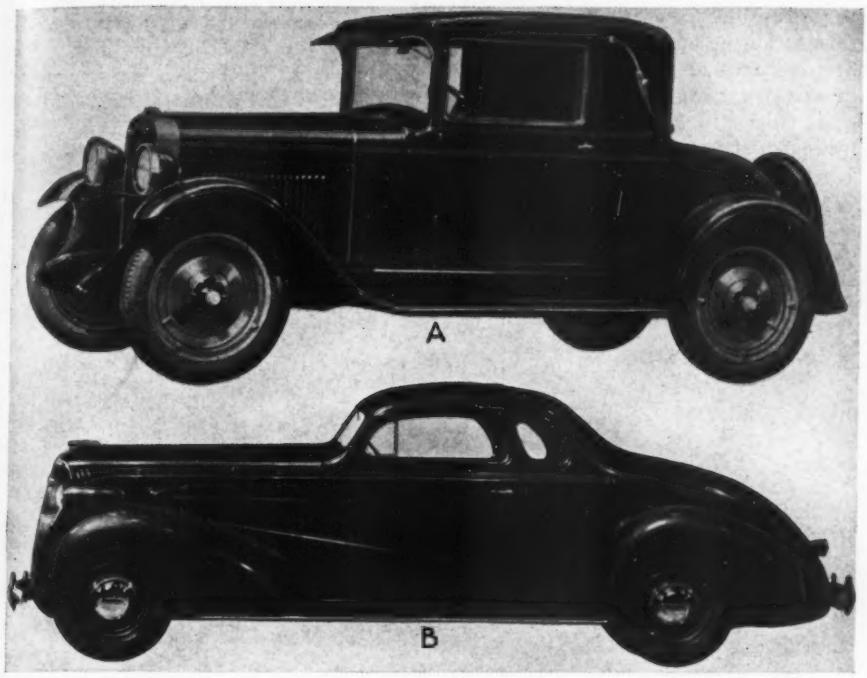


*Fig. 1. The old and the new*

mere indication of the many improvements and refinements which have been made in the engine and chassis of the car. A few of the many improvements which might be mentioned are: Vacuum-controlled distributor, thermostatically controlled choke, voltage regulators, increased compression ratios, automatic starters, down-draft carburetors, improved bearing and cylinder-block metals, improved piston design, and the like.

The realization of the extent to which these improvements affect automobile servicing will give rise to two questions in the minds of teachers engaged in training young men to service modern cars:

1. What effect have these modern improvements and refinements in the design and construction of the motor vehicle had upon the automotive-service occupations?
2. What effect will these changes in the automotive-service occupations have upon the school training program?

It was these thoughts that prompted the making of an extensive study of a number of garages and service stations and their equipment, in order to determine what service men are doing to keep abreast of modern developments, and to evaluate the school shop in terms of such findings.

Observations made while visiting service shops in several cities of various sizes, show that the old type of heavy repairwork is a thing of the past, and that in its place there has arisen a new type of automotive maintenance service. Recent improvements in construction and materials enable the owner to drive his car a greater number of miles without having to make any major repairs. In fact, there was a marked absence of honing, reboring, rear end, transmission, and other types of heavy repairwork in all of the shops which were visited. However, on the other hand there seemed to be a large volume of electrical motor tune-up, lubrication, brake, fender, washing, and polishing work done. Shops which were equipped to render this new type of service were doing good business.

One owner of an old-type shop, who was doing very poor business, told me that the new cars were a jinx to the repair business because they needed very little servicing. An examination of his shop revealed that he had made no attempt to modernize or equip his shop to provide the type of service needed on the new cars. His assumption that the new models needed no repairwork was unsound. True enough, there is little demand for the type of heavy repairwork which he expected to render. His failure was due to the fact that he had completely ignored the modern trends in automotive development and service which should have guided him in modernizing and equipping his shop.

In every locality visited, there was a marked trend toward a new type of service station which is built and equipped to render what might be termed "quick service." As shown in Figure 2, this new type of service station, which is entirely in keeping with modern automotive-service trends, is a combination of the old-time filling station and garage. It is equipped to furnish gas, oil, and lubrication, and to render ignition, electrical, washing, polishing, and minor motor service. Shop owners have found these services to be in greatest demand, and it is for these the school must train young workers.

It would be almost impossible to make such a survey without noticing the steps which the owners of the conventional type of garages are taking in order to compete with the new type of service stations.

In Figure 3 is shown a perfect illustration of how one progressive owner modernized the outside of his building. One corner of the buiiing is completely cut away to provide room for the installation of gas pumps. This was done in order that the establishment might increase its contacts with car owners. It is a known fact that the average motorist needs gas about forty times to every one that he needs mechanical service. Therefore, the logical place to come into contact with a great number of

*Fig. 2. The new type of super-service station*

motorists is at the gas pumps. An alert gas-pump attendant can be an excellent salesman for the shop's services. He, therefore, is of vital importance to every service shop, and if he is to fill his place properly, he must be well trained in automotive principles, in order that he may intelligently advise his customers. The very fact that service-station owners are fully aware of the importance of this position has created a demand for young men who have had suitable training to qualify them for this position.

*Fig. 3. Modernizing to keep in step with progress*

This owner's modernization plan did not stop with the outside of his building, but continued in even a greater extent on the inside. Knowing that reliable lubrication service is one that the modern motorist demands, he has equipped his shop to render this service. The neat, clean, well-equipped department shown in Figure 4 illustrates the importance which service men have placed upon lubrication. Note the pleasant appearance of the department, the systematic arrangement of the equipment, and the spotless condition of the floor and hoist. A lounge is also provided so that the customer might rest in ease while waiting for his car to be greased. In fact every effort possible was made to provide surroundings and service equal to that which the customer finds in other retail establishments where he spends his money.

From the appearance of this department, it is apparent that modern lubrication is no longer the job of the shop flunky, but rather one requiring highly specialized training for a scientific service. Here, again, is an opportunity for the school to train young men for this type of service. Such a training program would have to be in keeping with actual working conditions and environment, in order that the student might readily adjust himself to this modern setup once he is employed.

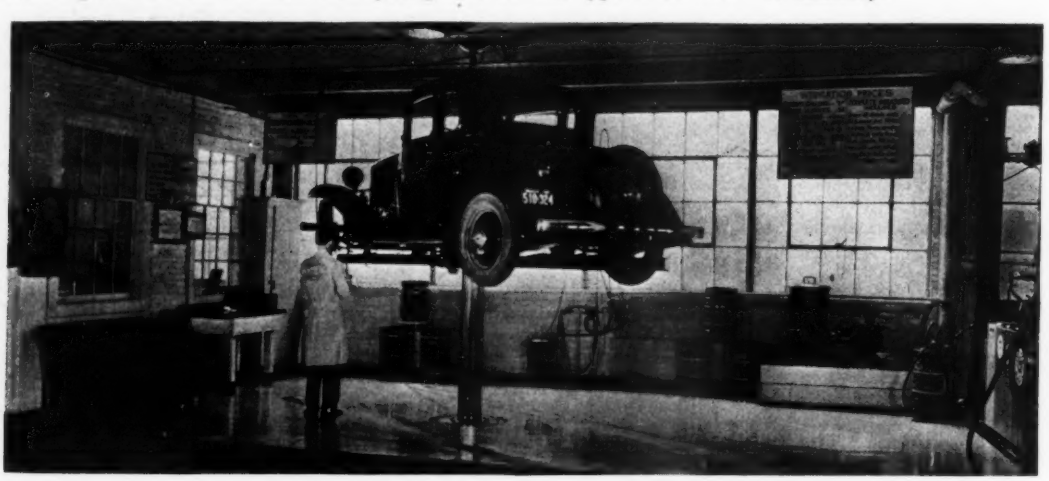

*Fig. 4. A modernized garage on the inside*

The typical motor-tune-up department shown in Figure 5 illustrates the effect which the modern high-compression engine has had on the service setup. The development of the high-speed engine with its intricate circuits and adjustments has put an end to guessing in motor tune-up. Today it is absolutely necessary to have modern scientific testing equipment properly to tune up a high-compression engine. Such pieces of equipment as the exhaust-gas analyzer, vaca-meter, motor-analyzer and distributor synchronizers which are shown in Figure 5 enable the service man properly to tune a motor. With this new type of equipment, the service man is able to keep the modern high-compression, high-speed engine performing at its peak of efficiency.

The extent to which scientific motor-diagnosing equipment has come into use in the last two years has almost revolutionized the service occupation. This change calls for a service man who is well versed in the underlying principles of electricity and the operating principles of the four-cycle internal-combustion engine. This

basic knowledge is essential that he may be able intelligently to interpret and use modern testing equipment. The mechanic who has not had this sort of training will not fit in this new service setup. The general trend is to replace the "strong-backed" mechanic of yesterday with a service man who has had training in basic principles and in the use of modern testing equipment. This, of course, means that training courses will have to be modernized in keeping with this new type of service.

*Fig. 5. A modern service laboratory*

### Significance

Teachers of auto mechanics may well ask themselves the following questions:

1. What effect will these revolutionary changes in the automotive-service field have on us?
2. What steps are to be taken in order to keep pace with an ever-changing occupation?

Many undoubtedly have failed to see the significance of the problems which the owners of service stations have had to solve. Or at least if they have grasped the meaning of it all, they have failed to do anything about it. This statement is based upon the fact that courses are still listed as "auto mechanics" in most of the school curriculums. Of course, the term "auto mechanics" means nothing in itself, as we could teach almost any phase of the service under this heading.

However, an examination of the "auto mechanics" courses of study of a great number of small and large school systems brought out four facts:

1. The school has failed to change its automotive course so as to provide training for many of the *newer and more demanded service occupations.*
2. It has failed to take into consideration many of the latest developments and improvements in the automobile engine and chassis.
3. It has failed to train the student to use scientific motor-testing equipment as found in the modern service setup.
4. It has spent too much time and effort on training for manipulative skills and not enough of training the student to make the *necessary social adjustments which he will have to make when working for an employer.*

Too many automotive teachers are in the same sort of rut in which the owner of the old-type garage finds himself. These teachers, like some garage owners, have failed to analyze their market in terms of new and modern developments in the occupation for which they are attempting to supply workers. This failure on the part of the teacher to analyze the market for the trained human product of his department, is, undoubtedly, due to the fact that the school does not have to show a profit in terms of dollars and cents. This is, of course, as it should be, for the school ceases to be a school and becomes a competitor to the commercial garage when this condition exists.

*Fig. 6. Another modernized garage*

However, if the teacher expects to make anything more than a repair shop of his departments, he must give serious attention to an extensive study of the possible places of employment for the boys whom he trains. This diagnosis must not only be

made of the establishments into which these boys may be placed, but it must be made in terms of the occupational level on which these boys will enter the occupation. The automotive teacher does not have to show a monetary profit, but he should be able to show accomplishment either in terms of vocational or general training, depending upon the objectives of his course.

Owners of service stations and garages have had to make revolutionary changes in their service methods in order that they may render the kind of service which the customer demands today. This means that the workers he hires must be trained to fit into this new type of service station.

As the automotive department in the school must depend on the support of the owners and managers of service stations, it is up to this department to train young workers who will be an asset rather than a liability to their employer. This calls for a reorganization of courses of study so as to give the student that training which will enable him to make an advantageous entry into this new service setup.

The progressive shop teacher, therefore, will make a complete analysis of the situation and then proceed to make the needed corrections in order that his course and methods will harmonize with the ever-changing occupational world.

### General Automotive Service

Instructors of automotive service may well take the following guiding points into consideration when organizing a course to train young workers to enter the automotive-service field. These guiding points are:

1. The trade must not be allowed to believe that the students who graduate from the automotive department are finished service men.
2. The student must be trained along the occupational level on which he will enter the service.
3. The student must be provided with a limited amount of advanced training (above the occupational level on which he may be expected to enter the occupation) in accordance with modern service trends.
4. The automotive-service market must be anlyzed in terms of possible employment, and workers must be trained for those branches of the service which seem to afford the greatest possibilities of employment for young workers.
5. The automotive-service field must be analyzed to determine the type and kind of work that is being done by the trade.
6. From the analysis referred to in 5, those jobs and operations which occur most frequently in actual trade practice must be selected and the students must be trained in these.

The guiding points listed in the foregoing are not new, yet there are many teachers who have failed to take these points into consideration when organizing their courses of study. Failure to consider them will result in a training program that is not in step with modern service practice, and those trained under these conditions will find it difficult to make an advantageous entry into their chosen occupation.

Even when these points are taken into consideration, there is the possibility that the training program may not be entirely in step with the modern service plan. This will be true, for instance, if the course was organized a number of years ago, and, like the 1930-model car, is now out of date. The automotive teacher must never lose sight of the fact that his department is training young workers for one of the most progressive occupations. Perhaps greater advancements have been made in the automotive-service field during the past three years than in any other occupation. Being responsible for the training of young men to enter this occupation, means to modernize courses, methods, shops, and equipment to harmonize with the progress that the occupation has made. With this thought in mind, it might be well for the automotive teachers to scrutinize their courses, methods, shops, and equipment in terms of the six guiding points.

An evaluation of an "auto-mechanics" course in this light, would reveal the fact that its content is not broad enough to include many of the very important branches of the automotive-service field. The very name of the course necessarily limits its content to that type of repairwork which we have associated with the old type of garage. The trade itself has forsaken the term "auto mechanics" for a new and more meaningful title "automotive service." In fact, leaders in the field everywhere are emphasizing "service."

A glance at the signs in front of the modern service stations shown in Figures 2 and 3, shows the extent to which the trade is emphasizing "service." The one in Figure 3 even stresses "Quick Service."

The service station shown in Figure 2 is neither a filling station nor a garage, but rather a combination of the two in a convenient layout to offer a quick service to the motorist. These new stations are entirely in keeping with modern service trends, and a clear indication of the type of service that is in demand. A look into the interior of these stations would show that they are built and equipped to offer washing, polishing, accessory, lubrication, minor repair and tune-up service. If the students are to be trained to fit into this new service setup, they must be trained in the particular services which are most in demand at the present time. Furthermore, following the example set by the occupation, the name of the course offered ought to be changed from "auto mechanics" to "general automotive service." This new title is more descriptive of the content which should be included in a modern course to train workers for the automotive-service occupations. In the "general-automotive-service" course, there ought to be included training for the *young man who attends the gas pumps,* and the *young man who is in charge of the lubrication department* shown in Figure 4. There are branches of modern automotive service which can no longer be disregarded in the training programs of today.

The kind of schooling which these service men need is a combination of merchandising technique and mechanical training all of which can well be included in a course in "general automotive service."

# Guidance Opportunities

## H. W. Teichroew

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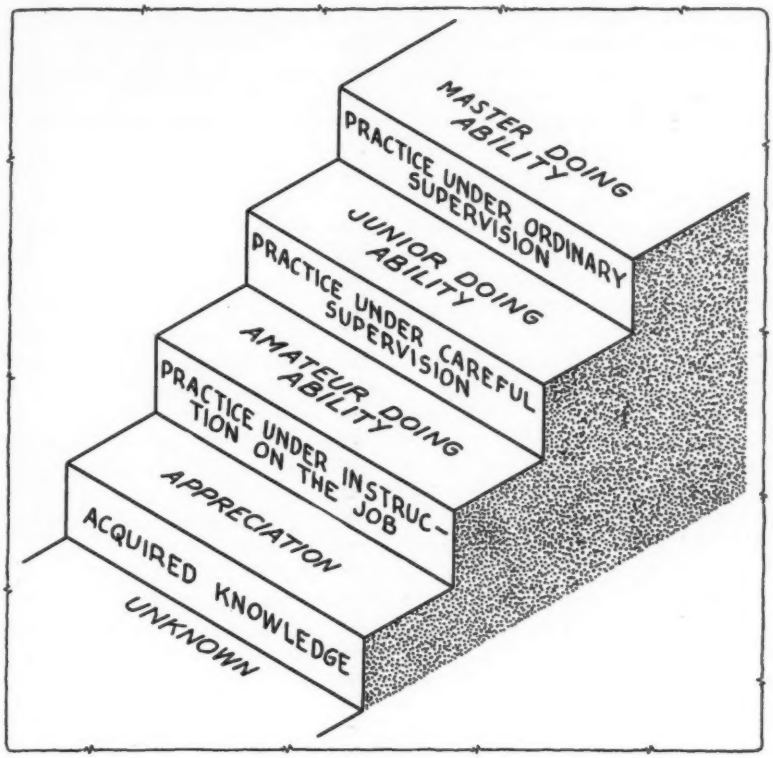
*That industrial-arts work contains guidance values is well known. All too few instructors take full advantage of their subject in this regard.*

This article was written to show that there is a need for guidance and counseling of a sort that can be provided for boys of the junior- and senior-high-school levels. Industrial-arts work offers rich guidance opportunities, and industrial-arts instructors should take the fullest advantage of the broad possibilities of their subject for sane guidance of those boys enrolled in their classes.

Recently, one of the regional agents for vocational education illustrated, in a striking way, the position of industrial arts in the trade and industrial training program encouraged by State and Federal funds. He pictured a five-step stairway, the treads of which were labeled beginning at the lowest, (1) Unknown, (2) Appreciation, (3) Amateur Doing Ability, (4) Junior Doing Ability, (5) Master Doing Ability. The four risers beginning at the bottom were

labeled: (1) Acquired Knowledge, (2) Practice Under Instruction on the Job, (3) Practice Under Careful Supervision, (4) Practice Under Ordinary Supervision. In order that a learner may advance from the *unknown level* to the *appreciation level* he would have to acquire specific knowledge to gain this appreciation. To advance to workers? We are here concerned with the last question.

There is a need for guidance of a sort that industrial-arts instructors can do. It is hoped the following three reasons will serve to arouse those industrial-arts teachers who do not as yet understand and utilize their guidance opportunities.




*Guidance opportunity*

*amateur doing ability level,* he would need to have practice under instruction on the job. Following that and with practice under careful supervision he should advance to *junior doing ability,* and with additional practice under ordinary supervision the learner should attain the goal of *master doing ability.*

Somewhere near the beginning of the second riser is where the industrial-arts teacher "lets go." And somewhere near the beginning of the fourth riser is where the vocational teacher stops his part of the training. This article is written with the trade-school point of view as a background.

The co-ordinator in his job of placement and follow-up finds the following questions among many others, most frequently recurring: (1) Why must trade schools admit so many who cannot be trained beyond mediocre ability?; (2) Why must trade schools admit those who won't allow themselves to be trained?; (3) How can a more readily trainable boy be induced to enter a trade school?; (4) How can existing agencies aid in the selection of future master

First, there is need for trained help in the world of work.

**TABLE I. Ratio of Apprentices to Workers (Males)**

| *Year* | *Apprentices* | *Workers* | *Ratio* |
|---|---|---|---|
| 1910 | 103,338 | 30,091,564 | 1 to 291.1 |
| 1920 | 130,967 | 33,064,737 | 1 to 252.4 |
| 1930 | 85,850 | 38,077,804 | 1 to 443.5 |

The alarming trend indicated by the 1930 ratio of apprentices to workers is accentuated by the following items gleaned from an editorial in the *Inland Printer* for July, 1935.

**TABLE II**

*Annually:*

1. Less than 1000 graduate from accredited printing schools.
2. Ten thousand journeymen craftsmen die.
3. Ten thousand more retire for one reason or another.
4. For every 20 lost to the industry, less than one restored by printing schools.
5. Government figures show nearly 25-percent loss of journeymen craftsmen.

The metal industry raised its voice in the September, 1935, issue of *Foundry:* "There is an ever-increasing conviction among the leading industrialists that it is personnel which determines the success of a concern, and that no effort should be spared toward efficient training. The problem of apprentice training for all industries and all levels of employment, is one that cannot be left to chance to solve. It is, as in earlier days of industrial history, a vital factor, the importance of which becomes even more accentuated under modern economic conditions."

Practically every issue of the *American Machinist,* a publication appearing every other week, carries an article discussing the ever-recurring question, "How shall trained help be provided?"

The second reason why industrial-arts people should take fullest advantage of their guidance opportunities, is best summed up by these three items from authoritative sources: (1) Annual crop of delinquents — 100,000 adolescents — boys and girls up to 19 years old; (2) There are 500,000 wanderers among adolescents and 3,000,000 unemployed youth in the country; (3) Too many high-school and college graduates are still unprepared to do well, any one kind of job.

The third reason is that the last five grades in the public school, provide the complete formal schooling for over two thirds of the boys and girls. The following figures are taken from a report issued by the Minnesota State Department of Education.

For every 100 who enter the first grade in Minnesota, 83 complete 8th grade; in the United States, 42. In Minnesota, 33 complete high school; in the United States, 22. In Minnesota, 2 enter college; in the United States, 1.

Now that we have "viewed with alarm," it is in order to suggest what three things industrial-arts men can do about it.

They can study each one of their boys. What kind of fellow is he? Does he have the characteristics needed to do good mechanical work? What influence will his personality have in getting a job or holding a job?

A nursery rhyme may help to answer the first question. "What are little girls made of? Sugar and spice and everything nice. What are little boys made of? Little boys are made of scissors and snails and puppy-dog tails, that's what little boys are made of."

Scissors may be sharp or dull. If sharp they cut through, leaving a clean-cut edge, they forge ahead easily, they make progress rapidly. If dull, they cut with difficulty, they leave ragged edges, they stall and jamb, they may arrive all right, but

at tremendous cost of energy on the part of someone. All teachers readily distinguish the two.

Snails are slow, they are deliberate, stay long in one spot, finally gathering energy or deciding to move. They may eventually arrive if not stepped on, or time doesn't overtake them.

And then there are the puppy-dog tails. They may be symbols of friendliness or of fear, but to be sure, they are always behind. Sometimes the tail even wags the dog, as in the case of the young fellow who tried to tell the employer how to run the business after the first payday.

But what are the characteristics to be sought in a boy to do good mechanical work? On page 9 of the January, 1936, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, Paul C. Hoopes says: "What are the qualities common to the reliable and good mechanic? The ability to think out or plan the work, measure or lay out with accuracy, cut and shape to the measured mark, and finally to correct any small errors that are made by even the best. . . . A keen mind for logical reasoning, an assembling in the mental storehouse of facts and reasons in a rapid reference way, practical originality, ingenuity, diligence, willingness to assume responsibility, observance of fine detail, the ability to reason from cause to effect and from effect to cause, are further requirements. The greater the capacity for logical thinking, the better will be the mechanic."

Does personality have any influence on job retention? The Westinghouse Electric Corporation once made a study of 3,800 cases, to ascertain the reasons why these persons were discontinued. Only one third of them were unable to do the work because of lack of skill and knowledge, all other reasons for discharge classified under personality difficulties.

One of the trainees from the St. Paul Vocational School was fourth choice at three different places to which he was sent to apply for a position in competition with three others, also graduates of the same department. After the third failure to get the job, he came to the writer, asking the reason. The co-ordinator's business is to find out what employers think of the graduates, so the young man was told that the last prospective employer had said "he was diffident and shy, his voice tone was weak, and probably this was all because of the blotches on his face." After consulting with the family doctor and rigidly following orders, the facial blemishes disappeared and he is now, four months later, employed at a monthly salary.

In 1934, twelve of our graduates were hired to work on a nine-month job for a large concern in St. Paul. As lay-off time approached, the company decided to retain three. Two of them were clean-cut, upstanding, good-mixer types, aggressive, reliable, leaders, capable of intelligent conversation, and willing to assume responsibility. The other was a quiet fellow, a hard worker, knew always what he was doing and why, neat, rather soft-spoken, steady, and versatile.

The last description applies also to the nineteen-year-old graduate who, four months out of school, was receiving $48 per month, and with the aid of his employer obtained a $75 job with another firm. Ninety days later, he was raised to $100 per month. Personality, knowledge, and skill do play a large part in job getting and job holding. Industrial-arts men are teaching in a field that gives play to these traits in the most natural setting available in public-school training.

Men in smaller communities seem prone to think that the only place to find potential skilled craftsmen, is in the city. Without actually setting it up, there seems to be what smacks of a sort of caste system. Whether or not Kipling wrote it, we don't know, but we are reminded of

> "Pity the poor benighted Hindu
> He does the best he kindu
> He sticks to caste, from first to last
> And for clothing lets his skindu."

Any school, rural or urban, should provide the fundamentals for acquiring knowledge and skill, and training in work habits that make a person employable.

And finally, men in the industrial-arts field should admit that their jobs are more than projects, drawing plates, or lesson sheets. They don't need to look around for more territory, but should develop the natural settings of their present field. Boys in the shops need to be thought of as the potential doers of things in years to come. The president of the International Business Machines Corporation in a speech, September 10, 1935, said, "This is not a machine age — it is a great man age. Those machines that we talk of are simply small tools that men have devised to enable them to do a better job. We are going to continue on in this great man age because men are doing more and better thinking than ever before."

Will the industrial-arts teachers help to find these men?

# An Individualized Flexible Speller

## J. Allen Morris

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*While the method of preparing a speller described in this article is not new, it is decidedly efficient. The lists here given may well be used as a basis for a useful speller in any school.*

Spelling instruction always presents an insistent and difficult problem to teachers of English in trade and vocational schools. For teachers who are trying to give their students something practical and concrete to take with them into the business world, here is a suggested approach to the problem of individualizing spelling work.

In almost every vocational school the problem of spelling is likely to be a difficult one. Spelling ability due to environmental factors is usually lacking. Former practice produces little effect on written work, and errors are frequent in almost all papers. There will always be some good spellers whose work is more than satisfactory, but most students will need help in spelling.

This article offers no panacea or cure-all for spelling troubles. Our attempts to help our boys are still just an experiment. What we are doing may not be the best thing, but it is at least a step in the right direction.

Obviously no speller can be published to fit exactly all the particular spelling needs of different schools.

The lists submitted herewith were gathered by putting each boy's mistakes on a separate sheet. In this way, a set of words which constantly caused trouble were tabulated. The words were then arranged alphabetically, printed in lists and used as individualized flexible spellers. Hundreds of these words came from business letters,

reports, themes, literature and history write-ups, and other class papers.

In order to adapt this material to the individual needs of any school, the teacher can use the words here printed as a basis for making a speller which will help him more nearly to solve the spelling problems of his school.

Different teachers will employ different methods for using these lists. Class differences in ages, ability, environmental backgrounds, and other important factors will determine the methods required. Two possible suggestions are offered here for what they may be worth:

1. Have each student use notebook paper suited to easy filing. Dictate a block of words without previous study by those taking the test. The number dictated should not exceed one hundred at a time.

2. Pass out spelling sheets (lists that are printed, mimeographed, or reproduced by some other means) and let each student check *his own list*. If properly prepared for doing this work honestly, the class will check papers with a surprisingly high degree of honesty. After each student has marked his mistakes, he returns his paper to have it rechecked — a proceeding necessary because even well-meaning students will miss some of their errors. The second checking can be done by anyone who can check the words against the printed list, by a good speller in another class, or by the teacher himself.

3. When the entire list of words for any given class has been dictated and checked, return to each boy all his papers so that he has a complete set of his own errors. Have the correct forms of these words written on one sheet of paper and returned. The now useless papers which were used in taking the dictated words can be destroyed. Let the good students study their words and check them off almost immediately; the rest of the class is then allowed the remainder of the term to study their words and learn them.

4. A slight change in the previous paragraph provides another method: The words missed can be underlined or ringed on the spelling sheet itself. The boy's name is written on the paper; then it is filed for future study and checking. When a boy has learned the block of words assigned for any special grade or class — for any particular period of time — he receives credit for his work.

Any student who learns the entire series of five lists will have a solid, practical, business and ordinary-life vocabulary of about 1,800 words. These will substantially increase the vocabulary which he had when he entered your school.

The first list, shown herewith, is used with the entering class in Murray Vocational School. One semester is allowed for the mastery of the 400 words contained in it.

---

**List I**

A

1. able
2. about
3. acid
4. across
5. advertisement
6. again
7. against
8. all
9. all right
10. almost
11. already
12. also
13. although
14. always
15. America
16. ambitious
17. among
18. angle
19. another
20. answer
21. any
22. April
23. arch
24. are
25. area
26. army
27. around
28. August
29. automatic
30. awake
31. awhile

B

32. barrel
33. basket
34. beautiful
35. because
36. been
37. before
38. beginning
39. behind
40. believe
41. better
42. between
43. bicycle
44. biting
45. black
46. blade
47. blue
48. board
49. boat
50. boiling
51. bottle
52. brain
53. brake
54. branch
55. break
56. brick
57. bridge
58. bright
59. broken
60. brown
61. brush
62. bucket
63. build
64. built
65. bulb
66. burst
67. business
68. busy
69. button
70. buy

C

71. cabinet
72. camera
73. can't
74. carriage
75. catch
76. caught
77. certain
78. certainly
79. chain
80. Charleston, S. C.
81. cheaper
82. chemical
83. chest
84. chief
85. chimney
86. chisel
87. choose
88. Christmas
89. circle
90. clean
91. clear
92. climbed
93. clock
94. clothes
95. cloud
96. cold
97. color
98. collar
99. come
100. coming
101. company
102. complete
103. conscious
104. corner
105. could
106. country
107. couple
108. course
109. cruel
110. curtain

D

111. dear
112. delicate
113. dependent
114. different
115. divided
116. doctor
117. does
118. doesn't
119. done
120. don't
121. door
122. down
123. drawer
124. drain
125. drinking
126. driving
127. dropping
128. during

E

129. early
130. easily
131. education
132. elastic
133. electric
134. engine
135. English
136. enough
137. equal
138. etc.
139. every
140. except
141. experience

F

142. father
143. February
144. felt
145. fertile
146. few
147. finally
148. find
149. fine
150. first
151. fixed
152. floor
153. foot
154. forty
155. forward
156. frame
157. frequent
158. friends
159. Friday
160. from
161. future

G

162. general
163. give
164. government
165. grabbed
166. graduated
167. grammar
168. great
169. guess

H

170. half
171. hammer
172. happened
173. haven't
174. having
175. head
176. healthy
177. heard
178. heart
179. here
180. high
181. himself
182. honestly
183. hoping
184. horse
185. hospital
186. hours
187. house

I

188. ideas
189. immediately
190. important
191. industrial
192. instead
193. interview
194. island

J

195. January
196. July
197. just

K

198. keep
199. kettle
200. key
201. knew
202. knife
203. knot
204. know

L

205. laid
206. late
207. leaf
208. learn
209. left
210. library
211. license
212. literature
213. living
214. loose
215. lose
216. lost

M

217. machine
218. machinist
219. make
220. making
221. many
222. match
223. material
224. meant
225. mechanic
226. mechanical
227. medical
228. might
229. military
230. minutes
231. money
232. month
233. morning
234. mortise
235. mother
236. motor
237. mouth
238. much
239. muscle
240. mystery

N

241. nail
242. name
243. narrow
244. natural
245. necessary
246. near
247. needle
248. nerve
249. new
250. nobody
251. none
252. normal
253. nose
254. November

O

255. October
256. office
257. often
258. once
259. only
260. opposite
261. other

P

262. paid
263. paper
264. parallel
265. parcel
266. past
267. pencil
268. physical
269. picture
270. piece
271. planned
272. planning
273. pleasant
274. please
275. polish
276. political
277. position

278. possible
279. present
280. principal
281. private
282. probably
283. promise
284. public
285. pulley

Q

286. quick
287. quietly
288. quite

R

289. raise
290. ready
291. received
292. regular
293. remember
294. report
295. responsible
296. right
297. room
298. rough
299. rule
300. running

S

301. safe
302. safety
303. said
304. Saturday
305. says
306. second
307. secret
308. seemed
309. seen
310. send
311. separate
312. September
313. serious
314. should
315. since
316. sitting
317. smooth
318. soft
319. solid
320. some
321. something
322. soon
323. spare
324. speak
325. special
326. steering
327. stepped
328. stopping
329. straight
330. strange
331. strength
332. studying
333. summer
334. sure
335. sweet
336. swimming

T

337. talking
338. tear
339. tenon
340. than
341. their
342. there
343. therefore
344. these
345. they
346. think
347. thoroughly
348. those
349. though
350. thought
351. three
352. threw
353. through
354. Thursday
355. tight
356. tired
357. together
358. tomorrow
359. tonight
360. too
361. trade
362. traffic
363. trained
364. trouble
365. true
366. truly
367. Tuesday
368. two

U

369. until
370. usually
371. used
372. using

V

373. value
374. violent

W

375. waiting
376. walking
377. want
378. wear
379. Wednesday
380. wharf
381. wheel
382. when
383. where
384. whether
385. which
386. white
387. whole
388. whose
389. wide
390. within
391. without
392. women
393. won't
394. wood
395. work
396. would
397. writing
398. wrong

Y

399. yesterday
400. young

## List II

A

1. absence
2. accepting
3. accurate
4. actually
5. address
6. advertisement
7. advice
8. again
9. airplane
10. all right
11. almost
12. already
13. always
14. among
15. amount
16. angle
17. apiece
18. apparatus
19. applied
20. appreciate
21. arrive
22. article
23. asks
24. athletics
25. at last

B

26. balance
27. base
28. bearing
29. because
30. beginning
31. believing
32. beneath
33. bicycle
34. biggest
35. bite
36. board
37. both
38. brake
39. brass
40. break
41. breath
42. brother
43. building
44. burst
45. busiest
46. business
47. buying

C

48. cable
49. calculate
50. calendar
51. can't
52. capital
53. careful
54. caring
55. carries
56. ceiling
57. certainly
58. change
59. chief
60. chosen
61. Christian
62. climbed
63. cloth
64. coal
65. column
66. comfort
67. coming
68. companies
69. complete
70. construct
71. control
72. copper
73. corner
74. cotton
75. could
76. country
77. couple
78. courtesy
79. cover
80. crank
81. credit
82. crush
83. cupful
84. current
85. curve
86. cylinder

D

87. danger
88. debt
89. decimal
90. decision
91. definite
92. describe
93. design
94. detail
95. different
96. dining room
97. disappear
98. divided
99. doesn't
100. done
101. don't
102. double
103. doubt
104. drier
105. driving
106. during

E

107. early
108. easily
109. edge
110. effect
111. eight
112. either
113. electric
114. engine
115. English
116. enough
117. entirely
118. equipped
119. error
120. evident
121. every
122. everywhere
123. excellent
124. except
125. exchange
126. expense
127. experienced
128. expert

F

129. factories
130. family
131. famous
132. father
133. favorite
134. February
135. few
136. field
137. finally
138. find
139. first
140. fitting
141. flame
142. follow
143. formerly
144. forty
145. forward
146. four
147. freight
148. frequent
149. friends
150. front
151. frying
152. furnace
153. funny

G

154. garage
155. generally
156. generous
157. goes
158. government
159. grabbed
160. graduated
161. grammar
162. greatest
163. group
164. guard
165. guide

H

166. half
167. happened
168. haven't
169. having
170. heat
171. heavy
172. himself
173. history
174. hole
175. honestly
176. hoping
177. hotter
178. hurried

I

179. idea
180. immediately
181. implements
182. in fact
183. in spite
184. inside
185. inspector
186. instead
187. intend
188. interview
189. iron
190. its
191. itself

J

192. January
193. jobber
194. journey
195. judge
196. just

K

197. keep
198. key
199. knew
200. knot
201. know
202. knowledge

L

203. laid
204. lead
205. learning
206. leather
207. led
208. letter
209. letting
210. level
211. library
212. license
213. light
214. limit
215. liquid
216. lively
217. loose
218. lose
219. losing
220. lucky
221. lying

M

222. machine
223. machinist
224. making
225. manager
226. marine
227. market
228. mathematics
229. mechanic
230. mechanical
231. meeting
232. memory
233. messenger
234. metal
235. middle
236. might
237. mind
238. mine
239. minutes
240. money
241. month
242. morning
243. mortise
244. mother
245. motion
246. motorcycle
247. move
248. much

N

249. nation
250. necessary
251. near
252. neither
253. new
254. nickel
255. ninth
256. nineteen
257. noise
258. none
259. notice
260. nowhere
261. number

O

262. offer
263. office
264. often
265. once
266. only
267. opened
268. operate
269. other
270. owner

P

271. paid
272. parallel
273. partner
274. payment
275. perhaps
276. permit
277. person
278. physical
279. piece
280. pipe
281. plane
282. planning
283. place
284. plate
285. please
286. pocket
287. point
288. polish
289. popular
290. portable
291. position
292. possibly
293. power
294. practical
295. prepared
296. price
297. pries
298. principal
299. probably
300. profit
301. property
302. prove

Q

303. quantity
304. quarter
305. question
306. quickly
307. quiet
308. quite

R

309. rail
310. raise
311. range
312. rate
313. ready
314. really
315. record
316. received
317. regular
318. remember
319. replies
320. report
321. reward
322. rich
323. road
324. roll
325. rough
326. running

S

327. said
328. salary
329. school
330. science
331. sense
332. separate
333. series

334. several
335. shining
336. should
337. sign
338. since
339. sincerely
340. size
341. shipping
342. smoke
343. soak
344. space
345. spade
346. speaks
347. special
348. square
349. station
350. staying
351. steam
352. steel
353. steering
354. stepped
355. stopping
356. stories
357. straight
358. street
359. strength
360. stretch
361. studying
362. suddenly
363. supplies
364. support
365. surely
366. surprise

T

367. tenon
368. their
369. think
370. thorough
371. threw
372. thrown
373. together
374. too
375. touch
376. toward
377. trade
378. trained
379. transfer
380. tries
381. truly
382. two
383. tying

U

384. until
385. usually
386. used to
387. using

V

388. vacancy
389. value
390. view
391. voice

W

392. waste
393. watch
394. week
395. weight
396. whether
397. whose
398. window
399. writer
400. writing

## List III

A

1. ability
2. abrupt
3. absurd
4. accident
5. account
6. actual
7. advertise
8. advise
9. against
10. agree
11. alert
12. alone
13. aloud
14. ambition
15. anxious
16. arithmetic
17. applicant
18. apprentice
19. attach
20. automobile
21. avenue
22. average
23. awhile

B

24. baggage
25. balance
26. banker
27. bargain
28. bear
29. believe
30. benefit
31. blacksmith
32. blast
33. bought
34. brakeman
35. brave
36. brief
37. broker
38. built
39. bulge
40. bulk
41. burnt
42. bushel

C

43. cancel
44. canvas
45. captain
46. career
47. carry
48. carried
49. cashier
50. casual
51. catalog
52. cautious
53. chance
54. charge
55. choice
56. chute
57. circuit
58. clamp
59. claw
60. cleanse
61. cleat
62. clerk
63. clinch
64. coarse
65. coast
66. coin
67. condenser
68. condition
69. conduct
70. contractor
71. correct
72. cost
73. coupon
74. creditor
75. crude
76. curious
77. curse

D

78. dangerous
79. daub
80. daughter
81. daytime
82. decide
83. definite
84. delicious
85. deliver
86. depression
87. device
88. diligent
89. dining
90. discuss
91. disk
92. distance
93. distinct
94. doing
95. dollar
96. dozen
97. drill

E

98. each
99. eager
100. earlier
101. earn
102. electricity
103. elevator
104. eleven
105. employee
106. employer
107. entire
108. entrance
109. everybody
110. examine
111. example
112. excepted
113. exciting
114. executive
115. expire
116. expressman
117. extreme

F

118. fact
119. faint
120. farmer
121. feature
122. fence
123. figure
124. film
125. fireman
126. flame
127. flint
128. float
129. forge
130. forward
131. found
132. foundry
133. frame
134. funds
135. furnish
136. furniture
137. further

G

138. gallon
139. game
140. gasoline
141. gate
142. gauge
143. gentlemen
144. gilt
145. globe
146. grammar
147. grease
148. guide

H

149. handle
150. handsome
151. hastily
152. heave
153. height
154. hesitate
155. hinge
156. holiday
157. hustle

I

158. identify
159. ignorance
160. imagine
161. immense
162. incline
163. inclosed
164. incorrect
165. indicate
166. individual
167. industrial
168. inform
169. inquiry
170. installment
171. insulate
172. interest
173. interfere
174. interior
175. invention
176. inventory
177. invite
178. invitation
179. issued
180. itemized

J

181. janitor
182. jerk
183. joke

L

184. label
185. lathe
186. lather
187. latter
188. leave
189. ledger
190. license
191. limited
192. loan
193. loose
194. lose

M

195. machinist
196. made
197. main
198. manager
199. manual
200. manufacturing
201. marvelous
202. mason
203. maul
204. meal
205. measurement
206. messenger
207. merchant
208. merely
209. metal
210. might
211. miner
212. mixture
213. model
214. month
215. motorman
216. movable

N

217. namely
218. neat
219. necessary
220. notify
221. numerous

O

222. oath
223. oblige
224. occasionally
225. occupy
226. occurred
227. omissions
228. operation
229. option
230. ordinary
231. original
232. ought
233. overdue

P

234. pages
235. painter
236. parade
237. passed
238. patrol
239. pawn
240. people
241. per cent
242. perfect
243. period
244. pick
245. pieces
246. pierce
247. pitch
248. plain
249. pleasure
250. plough
251. plumber
252. point
253. popular
254. portable
255. position
256. possible
257. pounds
258. powder
259. practice
260. prepared
261. present
262. pressure
263. printer
264. program
265. promised
266. prompt
267. proud
268. purchase
269. purpose

Q

270. quality
271. quart
272. queer
273. quite
274. quotation

R

275. reaching
276. readily
277. receipt
278. recently
279. recipe
280. recommend
281. recruit
282. referred
283. regard
284. remember
285. remodel
286. request
287. response
288. replying
289. resigned
290. respect
291. returned
292. rinse
293. rival
294. rolled
295. rough

S

296. sail
297. salesman
298. scale
299. scarcely
300. scorch
301. seaman
302. search
303. secretary
304. section
305. seeming
306. sensible
307. shade
308. sharp
309. shave
310. shear
311. shipment
312. shipped
313. should
314. shout
315. showing
316. similar
317. size
318. skillful
319. slope
320. small
321. smile
322. soften
323. soldier
324. source
325. southern
326. spade
327. special
328. sphere
329. splendid
330. stage
331. statement
332. steadily
333. steel
334. store
335. style
336. submitted
337. supreme
338. surveyor
339. switch

T

340. talk
341. taste
342. taut
343. teaching
344. tension
345. terms
346. thinner
347. thousand
348. thread
349. throat
350. through
351. thumb
352. thunder
353. ticket
354. tinner
355. together
356. tongue
357. total
358. transact
359. travel
360. trophy
361. twelve
362. twist

U

363. unique
364. unit
365. until
366. urge
367. usable
368. useful

V

369. vague
370. valid
371. value
372. valuable
373. variety
374. various
375. vicinity
376. vicious
377. violent
378. vocational

W

379. waist
380. warehouse
381. water
382. wealth
383. weather
384. weight
385. welcome
386. whack
387. whatever
388. wherever
389. whistle
390. whose
391. winter

392. wire
393. wooden
394. worm
395. written

Y and Z

396. yellow
397. year
398. your
399. youth
400. zinc

## List IV

A

1. ability
2. aboard
3. above
4. absent
5. absolutely
6. accept
7. account
8. achieve
9. acre
10. acute
11. admit
12. advance
13. advertise
14. again
15. ahead
16. allowed
17. all right
18. almost
19. always
20. American
21. among
22. answer
23. any
24. apiece
25. arguing
26. arouse
27. athlete
28. attempt
29. auditor
30. automatic

B

31. balanced
32. barred
33. barter
34. bathe
35. begging
36. beginner
37. been
38. beside
39. believe
40. benefit
41. blotting
42. blue
43. borrower
44. brand
45. breadth
46. break
47. bruise
48. built
49. business
50. busy
51. buy

C

52. cabinet
53. cablegram
54. calipers
55. can't
56. capacity
57. carburetor
58. cargo
59. carpenter
60. carrying
61. ceiling
62. cent
63. certainly
64. certify
65. charter
66. check
67. choose
68. closing
69. color
70. collector
71. column
72. coming
73. commerce
74. committee
75. commodity
76. company
77. compare
78. competent
79. competitor
80. confidential
81. congratulate
82. considerable
83. consign
84. construction
85. continue
86. contract
87. convex
88. core
89. co-operation
90. corner
91. costly
92. could
93. country
94. couple
95. coupon
96. course
97. courtesy
98. creditors
99. criminal
100. customs

D

101. dealing
102. dear
103. deficit
104. deliveries
105. depth
106. describing
107. desirable
108. diagram
109. diameter
110. dignified
111. dipped
112. director
113. disadvantage
114. disappointed
115. discount
116. dividend
117. doctor
118. does
119. done
120. don't
121. draft
122. draftsman
123. due bill
124. duty

E

125. early
126. either
127. elastic
128. energy
129. engineer
130. English
131. enlarge
132. entering
133. enough
134. equally
135. equipment
136. envelope
137. every
138. excellent
139. exchange
140. expenditure
141. experience
142. exploding
143. exposed
144. extent
145. exterior

F

146. facilities
147. failure
148. fastened
149. faucet
150. familiar

G

151. general
152. generator
153. governor
154. grammar
155. grateful
156. grinning
157. gross
158. guarantee
159. guess

H

160. half
161. hating
162. having
163. hear
164. heavy
165. here
166. hesitate
167. hour
168. hurriedly

I

169. ignorance
170. initial
171. illegal
172. immediate
173. important
174. impossible
175. include
176. indorse
177. injure
178. insolvent
179. install
180. instant
181. instead
182. intend
183. invoice

J

184. jarred
185. journal
186. just

K

187. knew
188. knife
189. knock
190. know

L

191. laborer
192. laid
193. larger
194. lawyer
195. letter
196. library
197. likely
198. limited
199. local
200. longer
201. loose
202. lose

M

203. making
204. many
205. margin
206. meant
207. mechanic
208. merchandise
209. mining
210. minutes
211. moderate
212. mortgage
213. money
214. monopoly
215. motion

N

216. naturally
217. neither
218. near
219. noble
220. nominal
221. none
222. notary
223. notice

O

224. obligation
225. obtuse
226. often
227. once
228. option
229. order
230. organization
231. outweigh
232. overissue

P

233. package
234. paid
235. painful
236. parcel post
237. partially
238. passage
239. pathway
240 pedal
241. perfect
242. permanent
243. persuade
244. pieces
245. pinning
246. planing
247. planning
248. plasterer
249. pleasing
250. point
251. positively
252. post office
253. practical
254. prefer
255. preside
256. president
257. previous
258. principal
259. private
260. probate
261. profession
262. progress
263. promptness
264. properly
265. property
266. proposal
267. proposed
268. provided
269. pulley
270. purpose

Q

271. qualified
272. quiet
273. quotation

R

274. railway
275. raise
276. random
277. read
278. ready
279. rebate
280. receipt
281. receive
282. reducing
283. register
284. regular
285. reliable
286. relief
287. remove
288. replied
289. reputation
290. request
291. resemble
292. reserve
293. resource
294. responsible
295. restaurant
296. result
297. return
298. reverend
299. route
300. routine
301. rotten
302. rubbing
303. rural

S

304. said
305. sample
306. scalper
307. schedule
308. seal
309. season
310. security
311. seeming
312. seldom
313. select
314. seller
315. senior
316. sentence
317. separate
318. shopper
319. should
320. shrewd
321. sight
322. signal
323. silent
324. simple
325. since
326. slammed
327. solid
328. some
329. soon
330. spacing
331. specialty
332. splendid
333. staining
334. stepped
335. stern
336. straight
337. supply
338. support
339. suppose
340. sure
341. surely
342. surface
343. surplus
344. surprise
345. survey
346. suspend
347. system

T

348. tear
349. temporary
350. territory
351. there
352. therefore
353. they
354. though
355. through
356. tightly
357. tonight
358. too
359. trapped
360. treasurer
361. triple
362. trouble
363. truly
364. trust
365. Tuesday
366. twins
367. two
368. tying

U

369. uncertain
370. underground
371. underwriter
372. union
373. universal
374. unskilled
375. until
376. used
377. usually

V

378. vacancy
379. vacation
380. valuing
381. very
382. vice-president
383. voice

W

384. waste
385. weak
386 wear
387. Wednesday
388. where
389. whether
390. which
391. whole
392. whose
393. withdraw
394. witness
395. women
396. wood
397. would
398. writing
399. written
400. wrote

## List V

A

1. absolutely
2. acceptance
3. accident
4. account
5. accurate
6. addition
7. adjustment
8. advertisement
9. advisable
10. afterward
11. agreement
12. already
13. always
14. altogether
15. ambitious
16. among
17. amusement
18. apartment
19. apiece
20. apparatus
21. appointment
22. appraise
23. appreciate
24. apprentice
25. approval
26. argument
27. arrangement
28. artificial
29. assets
30. assistant
31. assertion
32. attack
33. attempt
34. attention
35. attitude
36. attorney
37. attraction
38. auger
39. authority
40. awhile

B

41. balance
42. bearing
43. because
44. behavior
45. belief
46. beneath
47. between
48. bicycle
49. boundary
50. brake

51. brief
52. brilliant
53. buy

C

54. can't
55. carries
56. cause
57. ceiling
58. cemetery
59. certificate
60. changing
61. chauffeur
62. chopping
63. cigarette
64. citizen
65. cleansing
66. climbed
67. combination
68. coming
69. comment
70. commercial
71. commission
72. committee
73. comparison
74. compel
75. competition
76. complete
77. compromise
78. conclusion
79. condition
80. connection
81. consent
82. convey
83. corporation
84. courtesy
85. credentials
86. cunning
87. current

D

88. damage
89. decision
90. degree
91. deliberate
92. delinquent
93. department
94. description
95. desire
96. destruction
97. determined
98. development
99. dictionary
100. digging
101. director
102. discovery
103. discussion
104. disease
105. disgust
106. distance
107. distribution
108. division
109. document
110. doesn't
111. driving
112. duplicate
113. during

E

114. earn
115. earnest
116. easily
117. economical
118. education
119. effect
120. efficient
121. electrician
122. eliminate
123. encourage
124. enterprise
125. equalize
126. estimate
127. event
128. example
129. existence
130. expansion
131. except
132. experience
133. expert
134. explain
135. extreme

F

136. factories
137. father
138. February
139. few
140. field
141. forehead
142. formally
143. franchise
144. freight
145. frequent
146. function
147. further
148. futures

G

149. garage
150. gasoline
151. gauge
152. gentlemen
153. goes
154. governor
155. grabbed
156. graduated
157. grammar
158. graph
159. great
160. growth
161. guarantee
162. guard
163. guidance

H

164. happened
165. happiness
166. haven't
167. heard
168. height
169. here
170. hesitate
171. high
172. himself
173. honestly
174. hoping
175. hundredths

I

176. identify
177. immense
178. increase
179. indorse
180. indulge
181. industry
182. influence
183. instance
184. installment
185. instrument
186. insurance
187. intelligent
188. intention
189. interest
190. introduce
191. invention
192. inventory
193. involve
194. its
195. it's

J

196. January
197. journal
198. judgment
199. junior
200. juror
201. jury
202. just

K

203. keep
204. khaki
205. knew
206. knock
207. knowledge

L

208. laid
209. language
210. late
211. lathe
212. leisure
213. liable
214. license
215. likely
216. literature
217. living
218. lying

M

219. machinist
220. making
221. maintain
222. manager
223. manual
224. margin
225. material
226. mathematics
227. mechanism
228. meant
229. merely
230. merger
231. messenger
232. metallic
233. misspelled
234. monopoly
235. motion
236. motor
237. move
238. much

N

239. namely
240. near
241. neither
242. new
243. ninetieth
244. ninety
245. ninth
246. nominal
247. none
248. notary
249. notice
250. nowadays
251. nuisance
252. numerous

O

253. oblige
254. observation
255. obvious
256. offered
257. office
258. omission
259. once
260. operation
261. opinion
262. organization
263. ornament
264. other
265. our

P

266. paid
267. parallel
268. perceive
269. permission
270. persuade
271. physical
272. pieces
273. pierce
274. planning
275. politics
276. portable
277. position
278. preparation
279. president
280. principle
281. process
282. produce
283. prominent
284. promissory
285. proposition
286. prove
287. punishment
288. purchase
289. purpose
290. pursue

Q

291. quantity
292. quarter
293. queer
294. question
295. quick
296. quietly
297. quite
298. quotation

R

299. raise
300. range
301. reaction
302. readily
303. real estate
304. really
305. receivable
306. recently
307. recognition
308. recommend
309. referred
310. regret
311. relation
312. reliable
313. remarkable
314. remittance
315. report
316. representative
317. request
318. returned
319. rough
320. ruling
321. running

S

322. said
323. salary
324. satisfaction
325. Saturday
326. scarcely
327. scheme
328. scissors
329. scythe
330. secret
331. secretary
332. section
333. selection
334. serious
335. servant
336. several
337. shaking
338. shipment
339. sincerely
340. skillful
341. slippery
342. society
343. solicit
344. speedometer
345. spiral
346. square
347. statement
348. stationary
349. strictly
350. structure
351. style
352. submitted
353. subscribed
354. substance
355. substitute
356. suggestion
357. summary
358. summer
359. superintendent
360. surely
361. system

T

362. temporary
363. tendency
364. tension
365. their
366. theory
367. there
368. they're
369. think
370. though
371. thought
372. threw
373. through
374. together
375. too
376. tract
377. trained
378. transferred
379. transport
380. treasurer
381. tried
382. truly
383. twelve
384. two

U

385. undo
386. universal
387. upkeep
388. usable
389. utilize

V

390. value
391. vapor
392. vigilance
393. village

W

394. want
395. weight
396. welfare
397. who's
398. whether
399. whose
400. writing

# Teaching Devices in Mechanical Drawing


## Victor A. Johnson

*Wayzata, Minnesota*



*A study to determine the relative values of blueprints and models in the teaching of elementary mechanical drawing.*


To justify continued place in the curriculum of our public schools, a subject must be one of content accepted as valuable for the students who pursue it, and one of method so effective as to insure reasonable mastery of the content. Mechanical drawing is one of the industrial subjects introduced early in the movement for "practical" offerings and is today universally taught where industrial-arts or vocational education obtains in the schools. Because it is so widely presented it is quite logical and necessary that attention be given to basic studies in this field. We need factual evidence in order the better to recommend improvements in its materials and methods.

As the industrial-arts instructor extends his knowledge of *what* and *how* to teach, he is forced to the conclusion that past and present practices are as varied as the

(Continued on page 52)

# INDUSTRIAL ARTS and VOCATIONAL EDUCATION

**J. J. Metz, Editor**

## Getting Into a Rut

Not infrequently we hear statements such as "There is no advancement for him — he's in a rut," or "If you are not wide awake, you'll fall into a rut." There is another old saying, however, which says "There are two sides to every question," and a little study of the statements about getting into a rut may reveal that that, too, has two sides.

Of course, no one wants to argue that it may be good for the shop teacher to lapse into the self-complacent attitude of thinking that he is doing a good job when he teaches his course in the selfsame way, year after year, without bringing it up-to-date, without changing the projects which his students make, without brightening up the shop in any way, and without giving methods, that have been found helpful by other teachers, a trial. Such a man would be in a bad rut of the type that should be avoided by all means. He has become so inflexible that he cannot adapt himself. There also are good ruts, however, and the worth-while shop teacher will want to get into such a rut. The formation of a habit, for instance, is an effort to get into a rut. James lays down three maxims for acquiring a new habit, or for leaving off one already acquired. The first of these is stated thus: ". . . we must take care to launch ourselves with as strong and decided an initiative as possible." In the second, he says: "Never suffer an exception to occur till the new habit is securely rooted in your life." The third maxim suggests that: "Seize the very first possible opportunity to act on every resolution you make, and on every emotional prompting you may experience in the direction of the habits you aspire to gain."

What better method could one devise for getting into a rut? How could one more efficiently acquire the habit of attacking the problems which arise and vex the shop teacher?

The first thing, then, is the determination to get into the right kind of rut. The rut that leads one to attack, study, and decide questions that arise, not by snap judgments based on preconceived notions, but by taking a really scientific approach in arriving at a solution. The rut that fills one with the will to strive continually for a better way of doing one's work. The rut that drives one to learn from others, how they are solving a given problem, and then to give a fair trial to their methods if that seems advisable. The rut that urges one to apply the golden rule in one's contacts with students, fellow teachers, and others with whom one has to deal.

It is well to get into such a rut or ruts, and life's success for the teacher, and for that matter for any man, will largely depend on how well he can stay in the worth-while ruts which lead to the goal of a duty well done — a life well lived.

## Sir Henry Bessemer

The biography of this great English engineer contains so much of inspirational material that a perusal of it may well be made part of the work expected of every student of industrial arts and vocational education. He was born on January 19, 1813, in Charlton, near Hitchen, in Hertfordshire, England. His father was an excellent mechanic and because Henry Caslon, proprietor of the Caslon Type Foundry of London, was so well pleased with the letter punches made for him by the senior Bessemer, a close friendship arose between them. It is for this reason that Henry Caslon became the godfather of Henry Bessemer.

Later on, a former partner of Caslon's went into business with the elder Bessemer and a type foundry was erected on the Bessemer estate at Charlton. After young Henry finished school, he was permitted to work and experiment in his father's shop, and it was during these experimentations that he developed some interesting molding and founding methods. He also invented and perfected dies used by bookbinders and cardboard manufacturers for stamping their wares. At the age of 17, he moved with his father to London. He continued with his experiments and produced more inventions, among them being a device for dating stamps which was at once adopted by the government, but for which Bessemer received no remuneration or credit until 45 years later when he was knighted. At the age of 25, he invented a method of compressing plumbago dust which could be obtained very cheaply, so that it could be utilized for making lead pencils. Previous to his invention, the leads were sawed out of pieces of plumbago, the raw materials for which cost $20 to $25 a pound, while the powder could be obtained for about $1.25 per pound. He received approximately $1,000 for this invention, although the method is used to this day.

During this period, he also produced an improved type-casting machine in which type of a very dense and uniform metal could be cast at a rate of 50 to 60 pieces per minute. He likewise produced a special alloy for making engraved rollers for paper embossing and printing. When he was 21, he married the daughter of Richard Allen. He also carried on quite a remunerative business of making replicas of metals. At the same time, he experimented with and produced a composing machine which saw actual use in England and France. His experimenting truly covered an immense area and includes a method for embossing velvet, a mechanical means for making bronze powders which up to that time had been made by hand and accordingly were very expensive, and improved the method of manufacturing sugar. His study of glass-manufacturing methods resulted in a new method which reduced the time of fusion to one third of that originally found necessary. He did this by using but one third of the fuel, thus reducing the expense of this part of the manufacture materially. He also built machinery which permitted him to take the fused mass of glass and roll it into sheets. He also improved the method of polishing plate glass, and devised centrifugal pumps for raising huge volumes of water. For practically all of his inventions, he made his own drawings and wrote his own specifications. One of his inventions was a forerunner of the present braking system used on railway trains. It depended on hydraulic pressure and was too far advanced for his time, hence it was not adopted. He also made improvements in the heavier types of projectiles then in use and demonstrated them before Napoleon.

It was his study, starting in 1855, of how to improve the cast iron then used for making cannons that laid the foundation for his later metallurgical success in iron and steel. He had patented and actually fused steel in a bath of pig iron

in January, 1855, ten years before the Siemens-Martin process of making open-hearth steel which uses the same method, was patented. He had abandoned this particular process in order to experiment on a method of decarburizing gray pig iron by means of an air stream to convert it into malleable iron without puddling. He succeeded in decarburizing the pig iron by this method, but he consumed more fuel than he thought necessary. He therefore turned his attention to perfecting a method which would produce sufficient internal heat to retain the fluidity of the metal, by introducing atmospheric air until the whole mass was decarburized without adding external heat. After much experimentation, success seemed assured. Then the method was tried out commercially at Manchester, Dowlais in Wales, at Butterly in Derbyshire, and at Glasgow. At these places, pig iron containing a high percentage of phosphorous was used, and Bessemer's process would not turn it into steel. More study ensued and for a while the process was used only with imported Swedish charcoal pig iron in a steel works which Bessemer himself had to erect, as the other English iron workers no longer had faith in his process. The steel which he produced, while much lower in price, was inferior in no way to steels then in use. Gradually, the larger engineering firms in England started to use it. Further improvements in producing Bessemer steel were made and it became known all over Europe and in America.

To understand the improvement that Bessemer introduced in steel making, it may be well briefly to compare it with the method of manufacturing the steel then in use. By the old method, Swedish bar iron costing from $75 to $100 per ton was packed into large stone boxes, each bar being completely surrounded with powdered charcoal. It took about two days to bring the bars to a white heat. Then they were kept at this heat for six days, after which the cooling process would take another two days. Then the bars were broken into small pieces and melted in crucibles holding no more than forty to fifty pounds. About two to three tons of oven coke were required in this melting process for each ton of steel made. This method taking 10 or more days produced steel which cost from $250 to $300 per ton. Bessemer's process made use of pig iron which cost about $9 per ton. This, when taken as it flowed out of the blast furnace, could be converted into steel without using any extra fuel in about half an hour. Naturally, the steel thus produced could be sold at about one tenth or one seventh of the former price of steel. In 1861, 51,000 tons of the older steel were produced annually at Sheffield, England. In 1892, 10,500,000 tons of steel made by the Bessemer process were produced in Europe and America.

To explain Bessemer's process briefly, we must consider that pig iron is a composite of iron, carbon, silicon, sulphur, phosphorous, manganese, and a few other constituents. Steel is made up in a similar way, only the constituents are in different proportions. Since all of the elements in the pig iron except sulphur and phosphorous have a strong affinity for oxygen, the flowing of air through the molten mass of iron will produce definite reactions. In these reactions, more heat is produced, hence as Bessemer foresaw, no exterior heat needs to be furnished. In the blowing process, the carbon, silicon, and manganese are completely consumed, leaving a residue of sulphur, phosphorous, and slag. To change this mass into steel then requires the addition of specified amounts of carbon, silicon, manganese, and other constituents wanted in steel.

About the same time that Bessemer was making his experiments in steel making, William Kelly in the United States was perfecting the process very much along the same lines. A settlement made between Kelly and Bessemer, however, permitted Kelly to retire thus leaving the entire field in Bessemer's hands.

While Bessemer retired from active business when he was about 60 years old, his inventive genius would not permit him to remain inactive and he took up the study of how to make passenger vessels more comfortable for those using them, and had patents granted for making reflectors and lenses, making tin plate and black plate, making malleable iron, loading merchandise, and other labor-saving devices until 10 or 15 years before his death. He died on March 15, 1898, at his estate Denmark Hill, in London.

## The Future Craftsmen of America

On November 6 to 7, 1936, the first national convention of the Future Craftsmen of America was held in Detroit. About 200 boys attended as delegates from their respective local clubs, coming from every section of America. This organization is a boys' organization, its adult membership consisting of a limited number of public-school teachers and officials interested in craftsmanship. The work done by the organization is intended to serve industrial youth in a manner similar to that in which the Future Farmers of America serves agricultural youth. Awards are provided for achievement in craftsmanship, leadership, safety practices, skills in the crafts, and the accretion of technical knowledge.

There are no provisions made to provide for teaching of the crafts, yet the work done by the boys is supervised by the teachers who conduct this activity as part of the school club program. While the name "Future Craftsmen of America" is already criticized by some as a misnomer for the work which the promoters of the idea are proposing to accomplish, nevertheless, much good can come out of this movement if it is properly handled. Shop teachers especially should be interested in the development of these clubs. They have been tried out in many school systems and in many parts of the United States. Every shop teacher ought to study carefully the proposals made by those who inaugurated the work. The adoption of the Future Craftsmen of America Club idea is spreading more and more.

That this movement carries within itself the germs of much good becomes evident from a perusal of its objectives which may be summarized as follows: To promote the spirit of craftsmanship; to provide opportunities for experience in leadership; to encourage interest in hobbies and leisure-time activities involving craftsmanship; to aid the student in the intelligent selection of an occupation; to increase knowledge of industrial organization, the interdependence of workers, trade ethics, and safety; to promote thrift generally through the intelligent use of the products of industry and through the wise use of educational and training facilities; to motivate a studious attitude among youth interested in craftsmanship; to assist the student in the transition from school to work; and to promote fellowship among the youth interested in industrial education.

(Continued from page 49)

number of teachers. The field of mechanical drawing is not unique in this respect. Very few attempts have been made to establish the superiority of any given method or procedure. Since students are to be prepared to take their places and to function adequately in society, the teacher who does not investigate all possible questions relating to worth-while subject matter and pedagogy fails in his duty. It was with this belief that the work here reported was undertaken.

### The Problem

The writer, has had several years of experience in teaching mechanical drawing and has used many methods of presenting the work to freshmen boys. In order to make a thorough study of his own situation, he has made the public school at Wayzata, Minn., a laboratory for the experiment described in this article.

The freshmen boys come with little or no foundation for the first course in drawing, except that earlier work in art or mathematics in the elementary school may have formed some basis. In a few instances there may have been some exposure to the concepts or skills of drawing in the home or in the connection with clubs and the like.

The writer has used blueprints, models, and textbooks as instructional devices for such groups but has never actually attempted, except by a review of experience, to collect data as to the superiority of any one of them.

Opinions vary greatly among drawing instructors as to the comparative values between copying ready-made blueprints, and using models from which to work. A controlled comparison was, therefore, organized to determine, if possible, whether students acquire and retain principles, facts, and skills better by using the one or the other of these methods. Two groups of students were used in comparison, the instruction and other educative influences being kept identical so far as it was possible.

One group met the first hour of the morning session. Ample opportunity was thus afforded for making the materials to be used for this group easily accessible. The second group met after an intervening period of 40 minutes. This arrangement permitted time for disposal of materials used with the first group and to make special preparation for the second.

### Procedure

The study was conducted during the first semester of the school year 1934–35.

The drawing course offered consists of instruction in mechanical drawing in which an understanding of the fundamentals of drawing is given. No attempt is made in this course to present any particular field of drawing but rather to give a comprehensive understanding of drawing as it is related to an individual's everyday life.

The boys enrolled for the course fall into two groups: First, those who completed our own eighth grade the previous spring and have had an elementary-shop course; second, a much larger group of boys who come from the outlying rural schools and small independent school districts that are unable to maintain a high school. These boys are likely to have been denied shop experience of any kind.

It was possible to secure 16 matched pairs for this study. Seven members of each group were boys who had completed their eighth-grade work in our local school, and, therefore, had had a short foundation course in drawing. The remaining nine of each group were located at random.

The class period was 60 minutes in length, with five meetings per week for eighteen hours. The total of class time was 90 clock hours for each individual. Actual drawing manipulation occupied about 85 per cent of this time, while 15 per cent of it was used for demonstration and instruction.

### The Technique

In the class procedure when actual plates were drawn, the *control* group used blueprints of the plates to be drawn. The prints presented the problems with all dimensions and notes. Each pupil worked from a copy of the prints after the necessary instructions and demonstrations were completed. His problem, then, was to make a drawing exactly as shown and his accuracy of drawing and neatness determined the grade he would receive.

In contrast to this technique, the *experimental* group received models of the same objects that were drawn in blueprint for the control group. These models could be actually seen and handled.

In a few cases, they were made of softwood and painted to represent the actual object, while the large majority were actual objects secured from commercial and industrial sources.

The first group of blocks used as models in the course illustrated the three standard dimensions and were varied in shapes to make them suitable for the units of instruction where possible.

Other models, as the gasket, rudder brace, collar, link, cams, bolt plate, washers, beams, were obtained from commercial sources. An attempt was made to select those that would be suitable for the level of the ability of the ninth-grade group and would best illustrate the various principles.

The task of this group of boys was to make drawings from the models by studying and planning their layouts as they visualized them. No blueprints or drawings of the models were available to the student. All measurements were taken directly from the models. The determining of spacing, placing of views, number of views needed, and other decisions relative to the making of an accurate drawing, were left to the pupil. The demonstrations, reference work, and instructions to the groups were kept the same as far as it was possible to do so. Models and blueprints were furnished in sufficient numbers to allow each pupil to work at his own speed and achieve as much as possible. Because this was a beginning course in mechanical drawing, the chief units of instruction were as follows: orthographic, isometric, oblique, and cabinet projection; developments; scaling; lettering; dimensioning; geometric construction; blueprinting, and tracing.

### Tests

The writer used two forms of a test. Form A contained 160 items, 105 of which were of the true-false type, 23 multiple-choice, and 32 completion. Form B contained the same number of items and identical items as Form A, the difference being a change in their statement to alter the response. The Form A test was administered early in the course, before any drawing was attempted. Form B was given at the completion of the course. It was assumed that the difference between the total scores received on Forms A and B, by the two groups would show the superior method.

To prove the validity of the two forms of the test, it was administered to four different groups of students in as many different school shops. The mean coefficient of reliability of these four groups was .72 which is considered favorable for a study of this nature.

### Equating the Groups

In conducting an experiment of this type, it is necessary that the two groups be comparable. The following characteristics of pupil material that effect achievement in the field of experimentation are here considered:

1. *General intelligence in terms of point scores or of mental ages:* No attempt was made to group the members relative to their general intelligence. The only consideration was to keep the two groups as near an equal size as possible. The random grouping would naturally cause the distribution to equate itself. This belief was

verified at the conclusion of the experiment when an intelligence test was administered to both groups, and mean I.Q. scores of 103 and 107, respectively were obtained.

2. *Chronological age:* Chronological age is a vital factor in determining the achievement of pupils in a field of study. When extreme differences are apparent, it is evident that achievement will vary. The mean ages of the two groups in this study were 170.25 and 173.5 months, respectively.

3. *Previous achievement in the field in which experiment is conducted:* The previous achievement, in the field concerned in the experiment, of the members of each group cannot affect this study since the 14 students who had a shop course in mechanical drawing in our eighth grade were equally divided in the groups. The remaining nine in each group had had no previous drawing experience and hence could not affect the findings of the study. Considering this factor, the two groups were decidedly equivalent.

4. *Study habits:* The fact that all reference work and assignments were studied during the class period by both groups, at a time when preparation for the next plate or unit was necessary, proves that there could be no serious effect resulting from this nature of the work.

5. *Personality traits (attitudes, ideals, and interests):* Personality traits form a significant characteristic of pupils when considered as learners in school subjects. Of these, attitudes and ideals are intangible things difficult to measure and recognize in a group of students, yet, because the fact that they are students in a public school maintained in a suburban district representing approximately the same strata of American society, it is fair to assume that these traits are possessed in a like degree by the members of the two groups. However, the interest factor was very evident when it is considered that the drawing course was an elective in the school curriculum and selected by the boys because of that interest.

6. *Physical condition, sex, race:* Physical condition, unless there be a disability of a serious nature, would not greatly affect the achievement of either. The physical condition of the boys in both groups was uniformly good.

The sex and race of the members of both groups could not affect the results of this study, since all the members were boys of the white race.

Table I lists the pupils in the groups by pairs, and shows their individual scores on the Forms A and B as well as the mean scores.

**TABLE I. Comparison of Control and Experimental Groups in Gains Made on Forms A and B of the Test**

| *Control* | (*Blueprint*) *Form* | | *Pairs* | *Experimental Group* | (*Model*) *Form* | |
|---|---|---|---|---|---|---|
| *Group* | *A* | *B* | | *Group* | *A* | *B* |
| H.N. | 73 | 109 | 1 | A.M. | 76 | 108 |
| W.L. | 62 | 116 | 2 | G.S. | 63 | 104 |
| R.H. | 56 | 103 | 3 | R.F. | 56 | 104 |
| H.S. | 51 | 80 | 4 | G.C. | 50 | 99 |
| R.N. | 47 | 97 | 5 | A.A. | 47 | 115 |
| W.F. | 46 | 101 | 6 | A.D. | 45 | 96 |
| E.J. | 42 | 85 | 7 | C.G. | 39 | 78 |
| A.J. | 39 | 101 | 8 | J.M. | 38 | 90 |
| R.T. | 37 | 59 | 9 | H.G. | 36 | 86 |
| R.E. | 34 | 64 | 10 | B.B. | 33 | 79 |
| F.T. | 30 | 83 | 11 | H.E. | 30 | 78 |
| E.T. | 25 | 43 | 12 | V.E. | 24 | 68 |
| R.H. | 21 | 88 | 13 | H.A. | 23 | 109 |
| M.H. | 19 | 51 | 14 | E.P. | 18 | 47 |
| K.C. | 13 | 61 | 15 | R.C. | 13 | 68 |
| D.T. | 10 | 72 | 16 | J.N. | 9 | 86 |
| Means | 37.8 | 82.06 | | | 37.5 | 88.43 |
| Gains | 44.26 | | | | 50.93 | |

Difference of gains 6.67 in favor of the experimental or model group

## Summary and Recommendations

In reviewing the findings of this experiment, the following statements seem justified from the data presented and under the conditions of this study.

1. The groups were comparable in their initial drawing ability.

2. The measuring instrument used to measure achievement was established as valid and reliable.

3. It was established that the "model" group, over the period of this experiment, learned and retained facts better than the "blueprint" group.

4. Over the period of this experiment, the "model" group completed a combined total of eleven more plates than the "blueprint" group.

5. The mean score of the "model" group was six points higher on the final test than that of the "blueprint" group.

6. To the extent of this study and within the limits of this experiment, the use of models as a technique in teaching mechanical drawing was found to be superior to the blueprint method.

Since it was found, within the limits of this study, that the model technique of teaching mechanical drawing was superior to the blueprint method, the use of models as a teaching device is worthy of serious consideration by the instructors of the subject. The extent to which models should be used will be dependent upon the objectives of the course in each situation. However, a wise selection of projects for a course and the careful consideration of the models to be used will most assuredly determine in a large measure the results with any group.

A combination of both techniques would, undoubtedly, be more desirable in beginning courses in drawing. The models would serve as visual aids to the planning and mastery of the facts and knowledges that are basic to a course. The blueprints would act as definite illustrative material. While both of these techniques have a place in the trainng, we must not fail to provide opportunity for originality and self-expression.

A sufficient number of models should be secured to provide for individual work and these should be marked as to the plate numbers which they represent. They should be available at all times to the students for study and checking.

While a number of the simpler blocks with their various cuts were made in the school shop, the writer was able to secure many models from commercial firms. These models were sources of great interest to the students and were conducive to free discussions of the related information.

The use of models as a teaching device in junior- and senior-high-school mathematics and art classes also would be worthy of serious consideration. The response on the part of the drawing class in this experiment indicated that they are a desirable teaching device.

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## MECHANICAL DRAWING

**J. K. Olsen, Chicago, Illinois**

A. Is the language of industry
B. Furnishes a simple means of expressing thoughts
C. Can be used where neither a description nor a picture would serve the purpose
D. Is a definite system of using lines with dimensions to give an idea of shape and size
E. Has a system with its own simple orthography, style, and abbreviations
F. Is a most economical method for planning and keeping record of ideas
G. Is an international means of communication that is universally understood
H. Is an excellent medium for conveying ideas
J. Is one of the important factors in making possible present-day advances in scientific discovery and invention

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## CHECK-UPS

Each unit of instruction should have suitable check-ups. With beginners, these should come more frequently than for those of known ability.—*"Methods in Industrial Education," Struck, John Wiley and Sons, New York City.*

# Problems and Projects

## TEST IN SAFE DRIVING PRACTICES

**O. P. Schneider, Shop Superintendent, West Technical High School, Cleveland, Ohio**

Name .....

Homeroom ..... Score.....

DIRECTIONS: This is a true and false test. Some of the statements are true and some are false. Read the question, determine whether it is true or false. Then check your decision in the parentheses provided for your answer.

| | T | F |
|---|---|---|
| 1. When slowing down on a slippery road, it is better to disengage the clutch before applying the brakes. | ( ) | ( ) |
| 2. A blow-out on a rear tire is apt to have more serious results than on a front tire. | ( ) | ( ) |
| 3. A curve to the left is more dangerous to make at high speeds than one to the right. | ( ) | ( ) |
| 4. One should slow up before coming to a curve, and then feed the gas while driving around the curve. | ( ) | ( ) |
| 5. It is best to shift to a lower gear before one starts down a steep hill. | ( ) | ( ) |
| 6. It is a safe practice for the driver to depend on his stop-light rather than his hand to indicate that he is going to turn, or is coming to a stop. | ( ) | ( ) |
| 7. Smooth, gradual stopping, whenever the circumstances permit, is not generally taken as the signal of a good driver. | ( ) | ( ) |
| 8. When driving during a heavy rain, or in a fog, it is best to turn on the depressed light beam. | ( ) | ( ) |
| 9. In Cleveland one is permitted to park his car 10 ft. from an intersection on those streets where parking is permitted. | ( ) | ( ) |
| 10. If you are signaled by the car behind, you must slow down to allow him to pass. | ( ) | ( ) |
| 11. When driving astraddle of the car tracks, it is best, when attempting to get into the traveled portion, to do so by making a long gradual swing. | ( ) | ( ) |
| 12. It is safest when passing the vehicle ahead, to pass on the left after giving a signal. | ( ) | ( ) |
| 13. Having injured a pedestrian on the highway, the first responsibility of the automobile driver is to telephone the police department. | ( ) | ( ) |
| 14. A horn is a legal requirement on every motor vehicle. | ( ) | ( ) |
| 15. Since there is greater congestion of traffic at the intersections, it is safer for pedestrians to cross between rather than at the intersections. | ( ) | ( ) |

## A PRACTICAL ELECTRO-PLATING UNIT FOR THE SCHOOL SHOP

**Glen Barkes, Junior-Senior High School, Bloomington, Indiana**

Listed below are several good reasons why an electroplating unit should be included in the school-shop equipment:

1. It provides the best of experiences in electro-chemistry.

2. It provides experience in an outstanding field of modern industry.

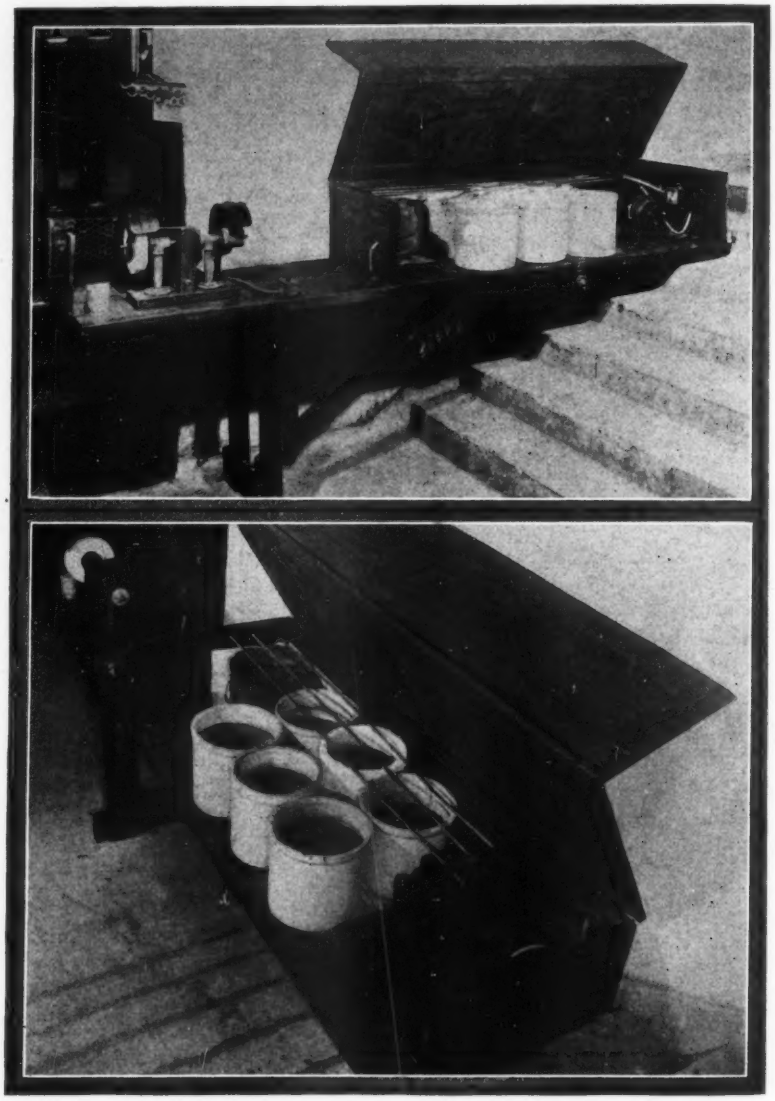
3. It enables the production of so-called art-metal projects without increased cost of materials.

4. Gives the project that "commercial" appearance which is a common basis for judging, especially so far as patrons are concerned.

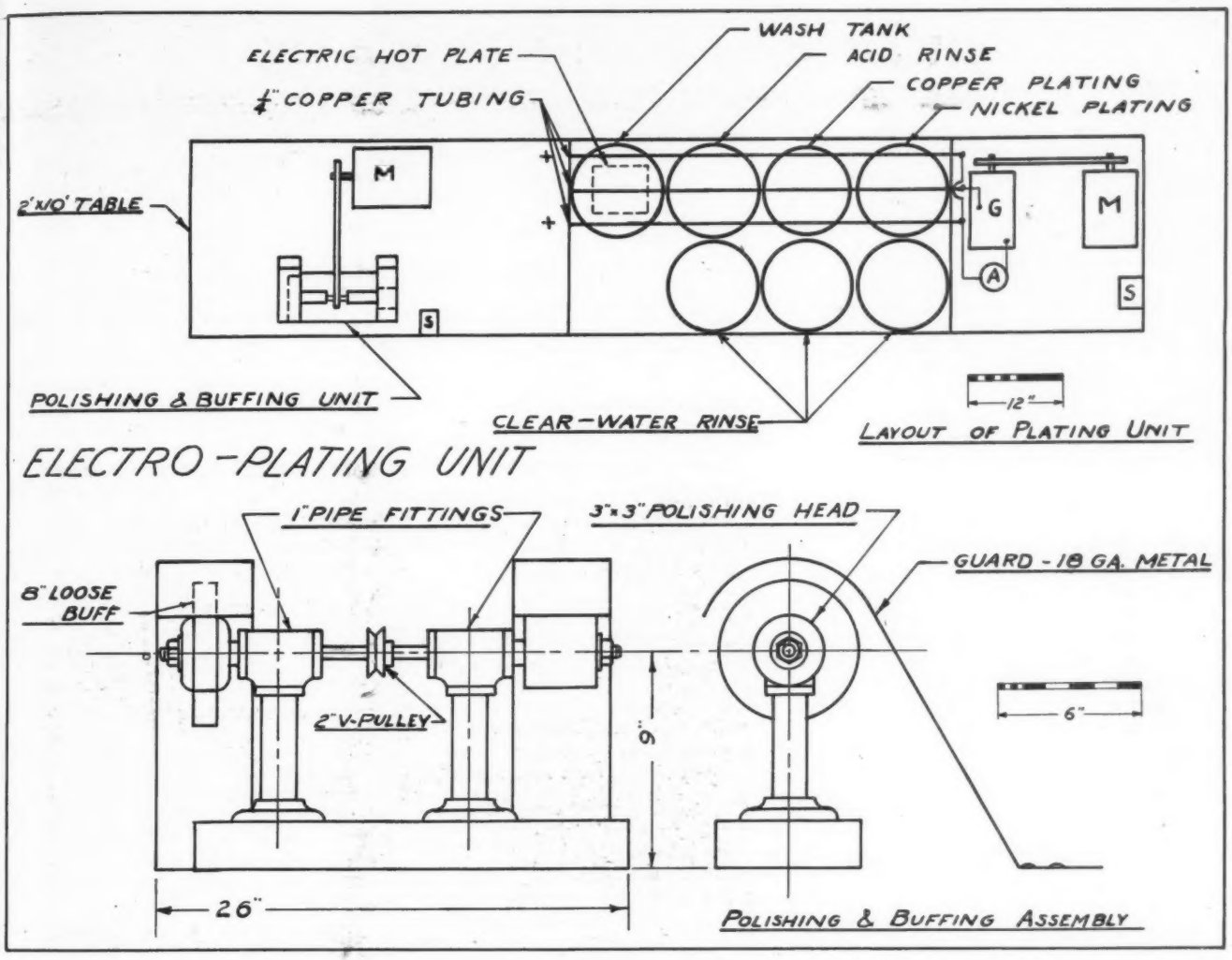
5. Very low operating cost.

The unit described here has proved very successful in the writer's shop during the past. The enthusiasm created in finely finished projects alone, justifies its place in the shop.

As shown in the plan, the complete unit including the buffer is mounted on a 2 by 10-ft. table. Since it is necessary to have a direct-current source for electroplating, an ordinary 6-volt automobile generator, operated by a ¼-h.p. motor, was installed. This unit may be installed with little cost, as a



*Two views of the electro-plating unit*




rebuilt generator may be obtained for 2 or 3 dollars, and an old washing-machine motor provides adequate power. A universal auto ammeter is sufficiently accurate for satisfactory plating.

The tanks are ordinary three-gallon earthen jars which provide adequate capacity for most metal jars made in school shops. One-quarter-inch copper tubing provides conductors of low resistance and sufficient rigidity for suspending work in the solutions.

The solutions themselves may be obtained reasonably from the school chemistry department or the local drug store. The following formula for copper plating has been used successfully:*

| | |
|---|---|
| Copper cyanide | 3½ oz. |
| Sodium cyanide | 4½ oz. |
| Carbonate of soda | 2 oz. |
| Hyposulphite of soda | 1/64 oz. |
| Water | 1 gal. |

This solution should be operated at a current density of from 4 to 6 amperes per square foot of surface to be plated.

This solution is very poisonous. However, at a current density not to exceed 6 amperes, the gas generated is absorbed in the solution, thus relieving the danger from this source. A cover should be arranged over the solutions and this should be kept locked when the plating unit is not in use. The cover illustrated is very practical.

A copper-sulphate solution may be used in place of the foregoing. It is not so poisonous as the cyanide solution, but it does not give such good results either. Commercially, the cyanide solution is most generally used.

For nickel plating:*

| | |
|---|---|
| Single nickel salts | 12 oz. |
| Double nickel salts | 4 oz. |
| Ammonium chloride | 3 oz. |
| Boric Acid | 3 oz. |
| Water | 1 gal. |

This solution should be operated at a current density of from 5 to 15 amperes per square foot. No gas is generated.

The poisonous nature of the solutions should not be discouraging. When properly protected, and their use supervised, the danger is entirely eliminated.

Bars or plates of copper and nickel are suspended from the two positive leads into the corresponding solutions. It is well to use lead electrodes in the wash tank, as this speeds up the cleaning process. The cleaning fluid consists of 1 oz. of caustic soda to each gallon of water and should be heated to the boiling point when in use.

The acid rinse is a 10-per-cent solution of hydrochloric acid.

The polishing and buffing unit is made of standard 1-in. pipe fittings and should be operated at 3000 r.p.m. The babbitt bearings may be poured directly around the shaft, after having plugged up the nipples. One-quarter-inch oil holes should be drilled in the top of the tees.

A 3 by 3-in. commercial sanding drum may be used with 3-in. 150-grain emery sleeves.

Satisfactory work may be secured by following this procedure:

1. Clean work to a bright finish with file and emery paper.
2. Polish, using 150-grain emery.
3. Wash thoroughly.
4. Rinse in clear water.
5. Rinse in acid.
6. Rinse in clear water.
7. Suspend on negative (center) conductor into copper tank. A copper base should be applied, even though nickel is to be applied last. Small battery clips with a short copper wire attached are convenient for suspending the work. Adjust generator to required

*These formulas were obtained from the *Plater's Guide-book*, a publication of Metal Industries, 116 John St., New York, and are obtainable for the asking.

amperage (this may be done by shifting the third brush) and allow the current to flow for 7 to 10 minutes for copper plating. If work is to be nickeled, 3 minutes is sufficient in the copper tank.

8. Rinse in clear water.

9. If work is to have a copper finish, dry and buff, using a good grade buffing compound. If work is to be nickeled, suspend in nickel tank and leave for about 10 minutes.

10. Rinse in clear water.

11. Dry and buff the same as for copper.

Since chromium plating requires a current density of from 75 to 125 amperes per square foot, it is impossible to plate objects larger than small letter knives with this power unit. However, the nickel finish obtained with this outfit is extremely satisfactory as it buffs out very brilliantly with little tarnish.

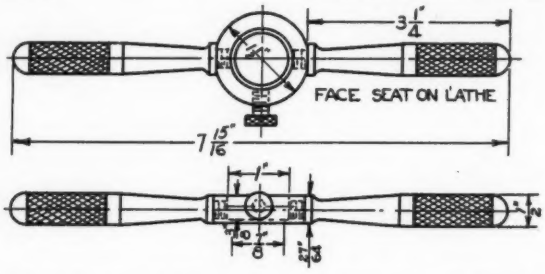
The unit just described was built completely with a new generator for less than 25 dollars.

## DIESTOCK

**Joseph Yuhasz, Central Junior High School, South Bend, Indiana**

The diestock described herewith is a practical tool, holding a ⅜ by 1-in. standard die.

The operations involved are turning, knurling, chucking, and use of the parallel bars, facing to thickness, drilling and boring in the lathe, and the use of the longitudinal and cross feeds for radial turning. This project teaches the boy assembling and fitting of machined parts and carries over the idea of exactness in measuring.




The average eighth-grade student has been able to make this diestock in eighteen 50-minute periods.

*Material:*

1 pc. ⅝ by 4 in. c.r.s.
1 pc. ⅝ by 4⅞ in. c.r.s.
1 pc. 1½ by ⅝ in. c.r.s.

*Procedure:*

1. Center, face, and straight turn the ⅝ by 4-in. piece for one of the handles shown in Figure 1.

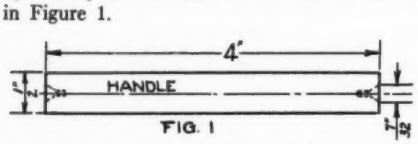


FIG. 1

2. Back gear the lathe and knurl as in Figure 2.

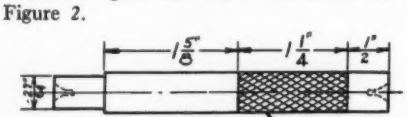
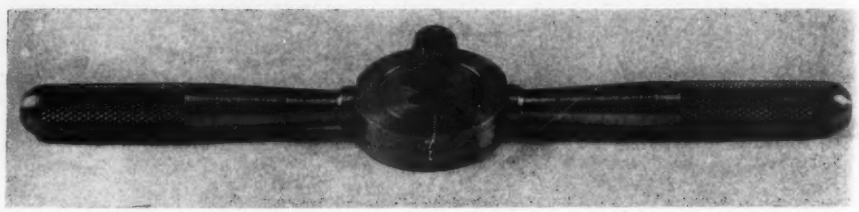


FIG. 2

3. Disengage back gears, and raise and tighten bull-gear clamp again.



*Machinist's punch and diestock*

4. Straight turn small end of stock as shown in Figure 2.

5. Set tailstock over for tapering. Have setup checked by the instructor. Turn taper (Fig. 3).

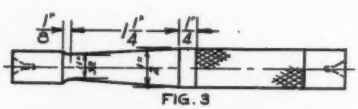


FIG. 3

6. Align centers of lathe for straight turning by moving tailstock back to center again. Be sure that the marks "O" and "O" are directly above each other.

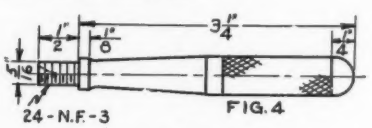


FIG. 4

7. Straight turn the 5/16-in. diameter to the length shown in Figure 4.

8. With facing tool, face a square shoulder at the seat of the handle.

9. Remove work from lathe.

10. Clamp the handle in a vise. Be sure copper plates are on the jaws to protect knurling.

11. Cut threads on end of handle with 5/16 in. S.A.E. die (Fig. 4). Reverse die to cut threads near shoulder.

12. Remove faceplate from lathe and attach universal chuck. Wrap a piece of emery cloth or sheet brass around knurled part.

13. Chuck work with the threaded end in the chuck.

14. Use both longitudinal and cross feeds, in shaping the ball end of the handle with turning tool.

15. Run lathe at highest speed and finish ball end with a file. Polish the end with emery cloth and oil.

16. Turn work end for end in chuck handle.

17. File and polish the rest of handle except knurled and threaded parts.

*Thumbscrew:*

18. Chuck the ⅝ by 4⅞-in. piece in universal chuck, allowing 1½ in. to project beyond jaws of chuck.

19. Straight turn one end 7/16 in. in diameter to the length shown in Figure 5.

20. With medium rollers, knurl as shown in Figure 5.

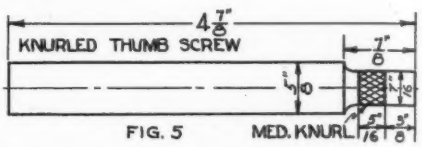


FIG. 5

21. Straight turn the body of screw to ¼-in. diameter to length as shown in Figure 6. Square the shoulder with facing tool.

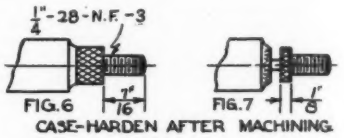


FIG. 6 FIG. 7

CASE-HARDEN AFTER MACHINING

22. Leave work mounted in lathe, hold die against end of stock. *Pull belt by hand* and cut threads on screw. Move belt back a little after every turn to relieve chips in the die. Reverse die to cut threads near shoulder. Use oil on the work while cutting the threads.

23. Set up cutting-off tool, and cut off thumbscrew as shown in Figure 7.

24. Wrap a piece of emery cloth around threads of screw and mount work in universal chuck. Face and polish with emery cloth and oil.

25. Caseharden the screw.

26. The remaining stock, after setscrew is cut off, makes the other handle for the die.

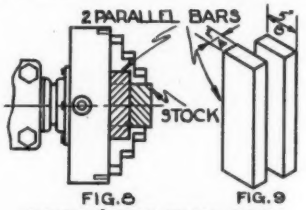


FIG. 8 FIG. 9

CHUCK & FACE EACH SIDE

Follow the steps as outlined for first handle.

*Body:*

27. Place the narrow edge of two parallel bars against the face of the universal chuck (Fig. 8). What is the purpose of these bars?

28. Hold the 1½ by ⅝-in. stock flat against edges of the two bars and tighten the jaws of the chuck with chuck wrench. The bars will slip out easily after the jaws are tightened. If the stock has not been cut straight it may be necessary to make slight adjustments so that the work turns fairly straight. Test by pulling belt by hand.

29. Start from the center and face stock. Have instructor check.

30. Turn stock end for end in chuck. Use the parallel bars again to set the work up true. Check carefully.

31. Face the piece to the required thickness as shown in Figure 10. *Have instructor check.*

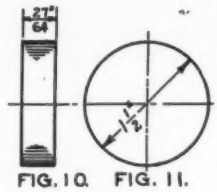


FIG. 10. FIG. 11.

32. Locate the center with the facing tool for drilling.

33. Remove dead center of lathe. Explain to instructor how this may be done.

34. Place a taper-shank drill chuck with 5/16-in. drill in tailstock spindle (Fig. 13).

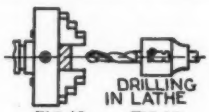


FIG. 12 FIG. 13

35. Loosen jaws of universal chuck and allow body of die to slide back until it is flat against face of chuck. Tighten the jaws (Fig. 12).

36. Drill a hole through the stock as shown in Figure 14.

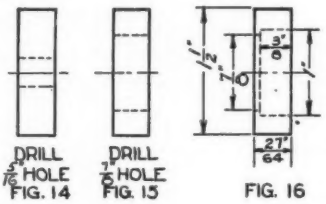


FIG. 14 FIG. 15 FIG. 16

37. Remove drill chuck from tailstock and mount a 7/8-in. taper-shank drill in the spindle.

38. Back gear the lathe to the slowest speed and drill this hole through stock as shown in Figure 15. Disengage back gears, raise and tighten bull-gear clamp again.

39. Set up a diamond-point boring-tool bit in boring bar, as shown in Figure 17, and

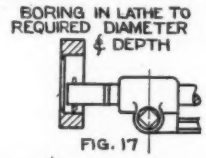


FIG. 17

place the cutting edge of the tool at center height. Have instructor help make this setup.

40. With cross feed, slowly feed out until a very light cut shows all around inside edge of hole.

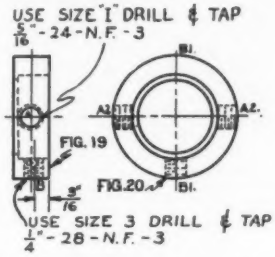
41. Tighten automatic longitudinal feed knob and let tool feed until cut is 3/8 in. deep. Check *often and very carefully* with scale.

42. Set a pair of inside calipers to 63/64 in. and bore this diameter to the exact 3/8 in. depth. Have instructor check.

43. Now, set the calipers to *exactly 1 in.* in diameter and finish boring. Be extremely careful about boring the exact diameter. Have instructor check. File and polish all surfaces with emery cloth.

44. With center head and scriber, locate diameter $A_2$–$A_2$ shown in Figure 20.

45. Carefully locate centers A–$A_1$, Figures 18 and 19, on both sides.




NOTE: These marks *must be exactly in the center* or the handles will not be in line.

46. Locate line $B_2$–$B_2$ by placing one leg of the dividers at center punch mark A and swing and arc A–a, the radius being approximately 1/4 of the outside circumference of the stock. Now place one leg of the dividers at punch mark $A_1$ and likewise swing arc a–a. Draw a straight line $B_2$–$B_2$ through the intersection of the two arcs (Fig. 18). On this line, locate center B as shown in Figure 19. *Have instructor check all these centers.*

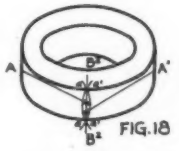


FIG. 18

47. Set up work in drill-press vise so *that line $A_2$–$A_2$ is exactly perpendicular* to drill-press table. *Test carefully with try square.* Have instructor check.

48. Drill a hole with a letter-size I drill at point A.

49. Remove the drill. Insert 5/16-in. 24–NF–3 tap in drill-press chuck. Tap this hole by *pulling belt by hand* (Figs. 19 and 20).

50. Reverse the stock in the vise, square up line $A_2$–$A_2$, and drill and tap hole $A_1$ in like manner.

51. Set up work in vise with line $B_1$–$B_1$ perpendicular to drill-press table.

52. Drill hole at *B only* with a No. 3 drill. Tap with a 1/4-in. 28–NF–3 tap (Figs. 19 and 20).

53. Obtain special screw mandrel from instructor. Set up work between lathe centers

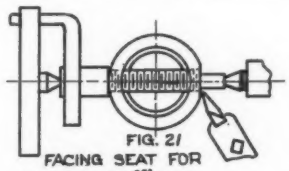


FIG. 21

and face each seat for handle as shown in Figure 21.

54. With a hack saw, cut the screws of the handle to the right length. Assemble the die-stock by screwing in the handles very securely.

NOTE: By carefully chucking work in universal chuck, the inside diameter of the die-stock can be retouched with boring tool, thus facing the ends of handle flush with inside diameter.

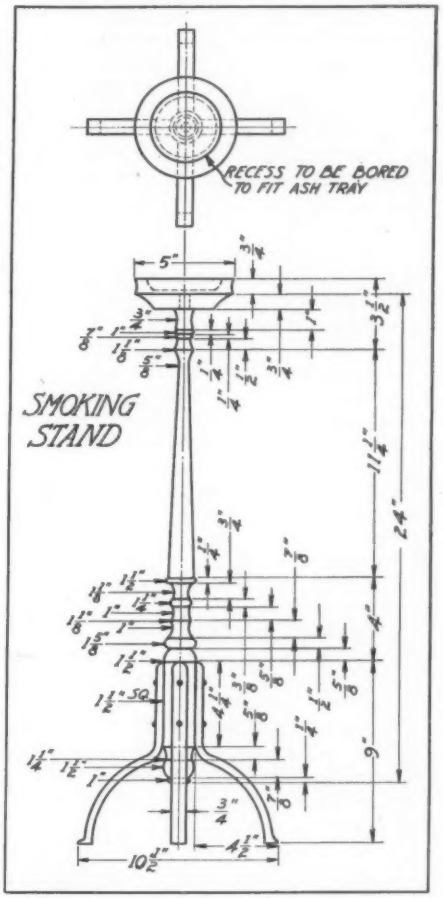
## SMOKING STAND

**C. M. Jochem, Jr., Pompton Lakes, New Jersey**

The smoking stand described and illustrated herewith has become very popular with the boys in our seventh and eighth grades. The designs of both spindle and top may be varied to give a variety of designs.

Both three and four legs are used. These are fastened in place with glue and r.h. screws.

The depression in the top must be made large enough to suit the ash tray that is to be used.




The finish should be chosen so that the stand will harmonize with the other furnishings in the room in which it is to be used. Frequently, a lacquer finish with bronze, gold, or silver blown on, makes a finish which adds a bit of color to the room.

This job covers a wide range of tool manipulations and gives added experience on the lathe.

## JARDINIERE AND PLANT STAND, AND AQUARIUM TABLE

**H. M. Andersen, Cicero, Illinois**

The teacher of general metal shop is frequently confronted with the problem of constructing suitable bases for such projects as

jardinieres and plant stands, aquarium tables, and the like. The design submitted herewith can be adapted to the problems just mentioned as well as to many others.

The material used for the jardiniere stand shown in Figure 1 and the plant stand shown in Figure 2 is ½-in. square iron except the hoop at the top which is ¼ by ⅜ in. and the scroll at the bottom which is ⅛ by ½ in. The members of the base should be cut to a length proportional to the height and spread of the upper members. The feet are forged to a taper and scrolled. The arch is formed cold, using a scrolling fork. In the project shown, the cross member of the base is 4 in. shorter than the one running parallel to the upright. The uprights for both the jardiniere stand and the plant stand require a piece of metal 6 ft. long. The jardiniere and the flowerpot trays were made of No. 22-gauge blue annealed sheet steel. All members were welded together by the oxyacetylene process.

The general design of the bases and uprights used for the projects in Figures 1 and 2, was also used in the construction of the aquarium table shown in Figure 3. Three-eighths-inch square iron was used in this latter project. The frame at the top is made of ½-in. angle iron.

All of the projects shown were finished by rubbing with emery cloth. They were left in the natural iron which is probably the best way of finishing iron projects to be used in the house.

## A CODE-PRACTICE BUZZER

**Byron M. Taylor, W. Wilson Junior High School, San Diego, California**

Many boys wish to practice sending and receiving code, so that they may obtain a radio-amateur's license. The instrument illustrated herewith will serve the purpose, and demands for its construction only a little skill, time, and material. It can be connected to a 6-volt transformer or a 6-volt battery, whichever is convenient.

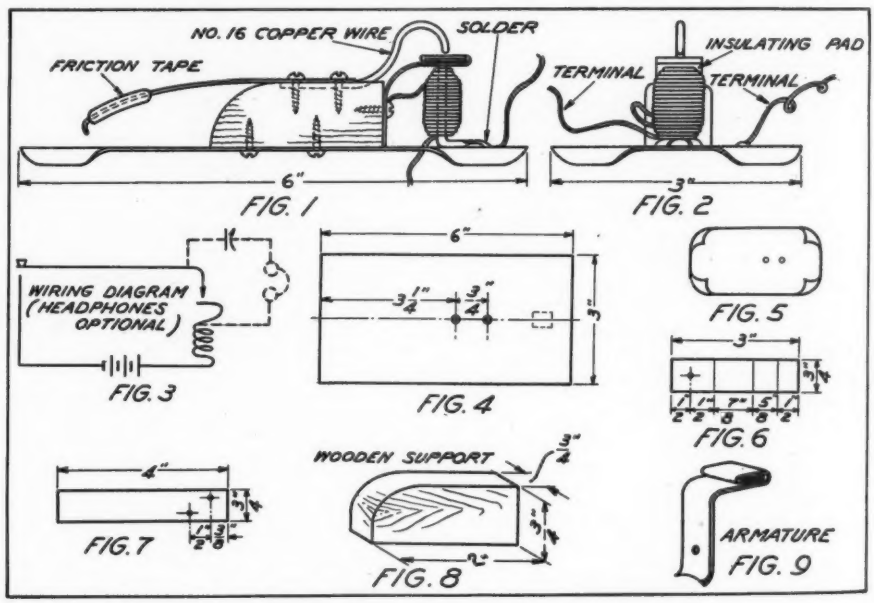
As a start on the construction, the iron core for the electromagnet may be made. The magnet is seen, mounted on the base, in Figures 1 and 2. For the core, bend a piece of ⅛ by ⅜ by 1⅝-in. band iron at right angles. The bend is made ½ in. from one end. This leaves the arm upon which the coil is wound, about 1 in. long. Before winding the coil, insulate the iron with friction-tape strips. These must completely cover the iron in the neighborhood of the coil.

Now wind the coil, using about 150 turns of No. 22 d.c.c. magnet wire. Start winding near the bend in the iron. The first layer will be 25 turns if the winding is tight and close. To build up the ends of the coil use the "bank" winding method. This involves laying the first turn of the second layer over and between the last two turns of the first layer, and so on for the successive layers. The sixth layer should have about 20 turns. In making the last turn, knot the wire with the turn so that it will not unwind. Make the usual tests for a "ground" or a "short" in the coil.

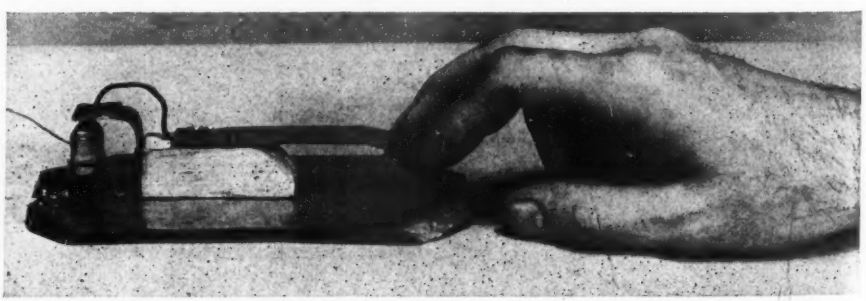
The base of the instrument, and the armature with its spring, are made of tin plate. The blanks for these parts are shown in Figures 4, 6, and 7. After cutting these out, and beginning with the base (Fig. 4), drill the ⅛-in. diameter holes as indicated. Supports for the base can be worked out of the blank by grasping each corner with long-nosed pliers and turning the pliers. The curled-up corners so formed supply the "legs" needed (see Fig. 5).

Figure 7 is the key blank. It has two ⅛-in. holes drilled staggered as shown. For the bending of the blank, the shape of the key in Figure 1 may be followed.

Figure 6 is the armature blank. This is shown in the finished state in Figure 9. Drill the ⅛-in. hole as indicated and lap one end of the material ½ in, and then ⅝ in., as seen in the illustration. At the other end turn up the corners of the metal so as to form projections which will penetrate the wooden support when the armature is in place (Refer to Figs. 1 and 9). Make the wooden support out of 1-in. finished lumber. To avoid




*Code-practice buzzer details*



*Code-practice buzzer*

splitting, use a soft, compact grade such as sugar pine. The piece is ¾ by ¾ by 2 in. before it is shaped. Shape it as shown in Figure 8. Screw the support to the base with two No. 6 by ½-in. r.h.b. wood screws. The holes have already been drilled in the base. Tap the projections on the armature into the wood, and with another similar screw, secure the armature in place at right angles to the base.

Before screwing on the key and spring, it is necessary to have the armature-contact point. It consists of 3 in. of No. 16 bare copper wire bent as shown in Figure 1. Place the straight part of the wire in position on top of the support and between the staggered holes punched in the wood for the screws. Then lay the straight part of the key over this and push down on the combination until the wire beds in the wood.

Arrange the magnet on the base centrally under the thickened part of the armature. This position of the armature is indicated in Figure 4. The foot of the core is now soldered to the base.

The wiring diagram, Figure 3, shows the attachment of one coil terminal to the armature and the other to the source of electrical energy. Put the end of the first under the screw holding the armature to its support. The line return is a piece of magnet wire soldered to the base, preferably in the neighborhood of the magnet. These connections are seen in Figure 1.

To make the instrument ready for use, attach it to the battery or transformer and, by bending, adjust the wire contact so that when the key is depressed a steady buzz is maintained. The buzz should start and stop as the key is depressed or released.

The armature must not make electrical contact with the top of the magnet core. Cover the top of the core with friction tape.

Wrapping friction tape around the key where shown in Figure 1 will make a more agreeable contact for the finger than that afforded by the bare metal.

In that which follows, is shown a grouping of the international Morse code, designed to aid a student in learning. You will note that the letters of the alphabet are grouped much as the numbers are grouped from 1 to 5 and from 6 to 10. The groups may be studied vertically or horizontally or both. Words may be made up from one or more groups.

Do not memorize the characters of the code from the page by reading. Memorize them by their sound on the buzzer. That is, learn them through the ear and not through the eye. Either use the buzzer yourself, or better, have someone "send" the signals for you.

For further study on becoming a radio amateur, see *How to Become a Radio Amateur* or *Radio Amateur's Handbook* both published by the American Radio Relay League, Hartford, Conn.

### International Code Grouping

Time Intervals: 1 dash equals 3 dots. Space between parts of same letter equals 1 dot. Space between 2 letters equals 3 dots. Space between 2 words equals 5 dots.

| | | | |
|---|---|---|---|
| 1 | ·———— | 6 | —···· |
| 2 | ··——— | 7 | ——··· |
| 3 | ···—— | 8 | ———·· |
| 4 | ····— | 9 | ————· |
| 5 | ····· | 0 | ————— |
| E | · | T | — |
| I | ·· | M | —— |
| S | ··· | O | ——— |
| H | ···· | CH | ———— (G.-S.)* |
| 5 | ····· | 0 | ————— |
| E | · | T | — |
| A | ·— | N | —· |
| U | ··— | G | ——· |
| V | ···— | Ö | ———— (G.) |
| 4 | ····— | 9 | ————· |
| E | · | T | — |
| A | ·— | N | —· |
| W | ·—— | D | —·· |
| J | ·——— | B | —··· |
| 1 | ·———— | 6 | —···· |
| A | ·— | N | —· |
| R | ·—· | K | —·— |
| Ä | ·—·— (G.) | C | —·—· |
| L | ·—·· | Y | —·—— |
| P | ·——· | X | —··— |
| I | ·· | M | —— |
| F | ··—· | Q | ——·— |
| Ü | ··—— (G.) | Z | ——·· |
| Period | ·—·—·— | Interrogation | ··——·· |
| Comma | ——··—— | Break | —···— |

*G.-S. = German-Spanish; G. = German.

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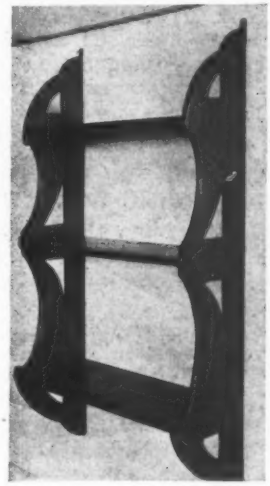
## HANGING SHELVES

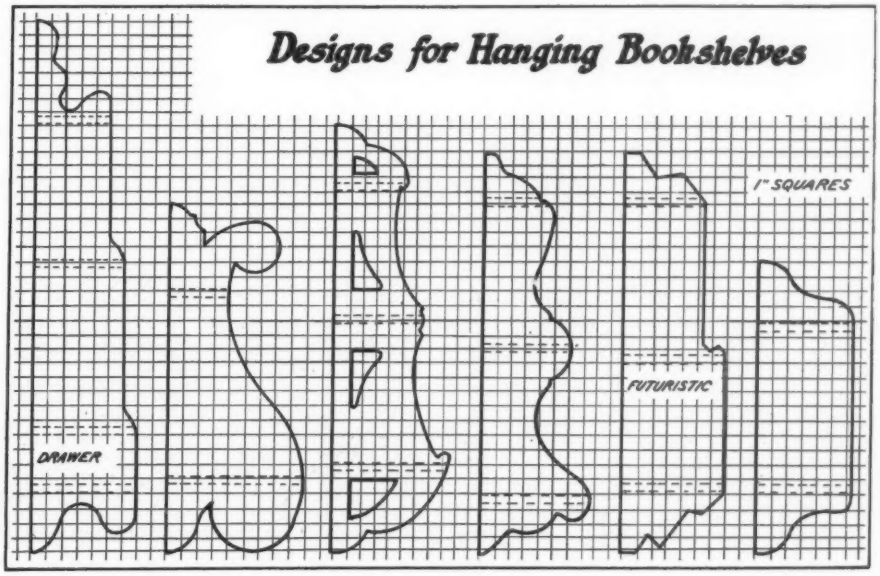
**A. E. Gray, Austen Riggs Foundation, Inc., Stockbridge, Massachusetts**

The hanging shelves shown offer a splendid opportunity for linking up the shop with the home in a practical way. There is an unlimited number of possible designs, ranging from the plain, simple lines to the more ornate colonial designs. Sizes of shelves may be varied according to the space they are to occupy. White pine, poplar, walnut, and mahogany, ⅜, ½, or ¾ in. thick are all excellent for this project. The finish can be



oil, shellac, wax, varnish, lacquer, or paint in some of the great variety of pleasing colors. The new "quick-drying" enamels and lacquers are excellent for this work.

The only real problem in connection with making hanging shelves is that of fastening in the shelves. There are many ways to do this and the method chosen depends upon the grade of the student. For lower grades, nailing is advised, with simple butt joints. The nails can be set and the hole filled with wooden pegs glued in and smoothed off nicely, or plastic wood may be used, or sawdust and glue or stick shellac. Another method is that of fastening with screws. Round-head blued or brass screws may be used and the heads allowed to show, or flat-head screws sunk into the wood with the hole plugged may be uti-



lized. In using wood to fill the holes where screws are used, a very satisfactory job is obtained by gluing in "screw plugs" used in boat building. These plugs are made in various kinds of wood and are cut with the grain so that in the finished job they are hardly discernible. For more advanced students, dadoes should be cut in the side pieces and the shelves glued in. Gained joints, which are harder to make than dado joints, also may be used.

For hanging the shelves, small metal hangers or screw eyes may be used. For advanced workers, drawers may be added to occupy one shelf, or vertical partitions may be set in.

## PROVIDING EXTRA SPACE FOR BELL WIRING

**Charles C. Bradley, Ottawa, Canada**

In these days of larger classes, teachers of electricity have experienced difficulty in providing sufficient extra space, with power for bell wiring. My solution of such a problem may be helpful to others, so I am passing it on.

I used a 50-watt bell-ringing transformer, and find it very satisfactory except for the fact that pupils are likely to leave the wires short-circuited and thereby damage the transformer. To prevent this and also to assist me in locating wrongly connected systems, I use a transformer with leads attached to a plug cap, so that it can be connected to a receptacle just when required.

Mounted on a board with the transformer are three Edison receptacles, one in parallel and two in series, the first one using a lamp as pilot and one of the latter a 60-watt lamp which allows the transformer to draw sufficient current for operation (see Fig. 1). The other series receptacle contains a 2-amp. fuse for the protection of the transformer.

Bell wires are run from this device to the wiring-board space, in the room. Each board is equipped with short lengths of flexible cord (one 6 in. longer than the other to prevent shorting of terminals) with Pee Wee clips so as to allow power to be quickly connected to job for testing. This arrangement is very helpful, especially when taking lessons on faults on wiring of bell systems, when each pupil connects his job *in turn*. For example: If a *dead short* circuit is supposed to be on the wiring system, series lamp will light immediately when the power clips are connected. If *temporary short* circuit should be asked for, the series lamp will light when the push button is pressed, after connecting the test clips. A *closed circuit*, of course, will cause the bell to ring just as soon as the test clips are connected.

By simply watching the series lamp, then, the instructor can tell whether the required fault has been put on the wiring system.

In ordinary wiring practice, if the series lamp lights continually, have pupils disconnect boards in turn until the faulty system is located.

This transformer arrangement is very handy, too, for demonstrating to junior classes the close relationship between input and output of transformers, as the 60-watt lamp increases in brilliancy when added loads are connected to the secondary side.

The wiring boards illustrated, are useful for providing additional working space for large classes. As shown, the additional wiring boards may be placed in front of the blackboard or bulletin board by means of iron clips fastened to the frame of the blackboard, through which the supporting cleats of the wiring boards slip. In this manner, the wiring boards may be put up and taken down.

## FIREPLACE SET

**Gerald A. Boate, Seattle, Washington**

### The Tongs

The tongs shown in Figure 1, were designed to conform with the poker which appeared on page 27 of the January, 1931, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, the shovel which appeared on page 34 in the 1932 issue; the andirons on page 21, January, 1933, issue, and the fire screen, page 288, September, 1933.

The tongs consist of two pieces of ⅜-in. square mild steel. The operation consists of forming the oval hand holes in the ends of the tongs, twisting the handles, punching or drilling the holes for the pin, and flattening and forming the ends.

The pivot bosses should be ground or filed smooth. Use a fine-thread ⅜-in. bolt for the pivot. These bolt can be bought case-hardened and cost but a few cents. The hexagonal nut

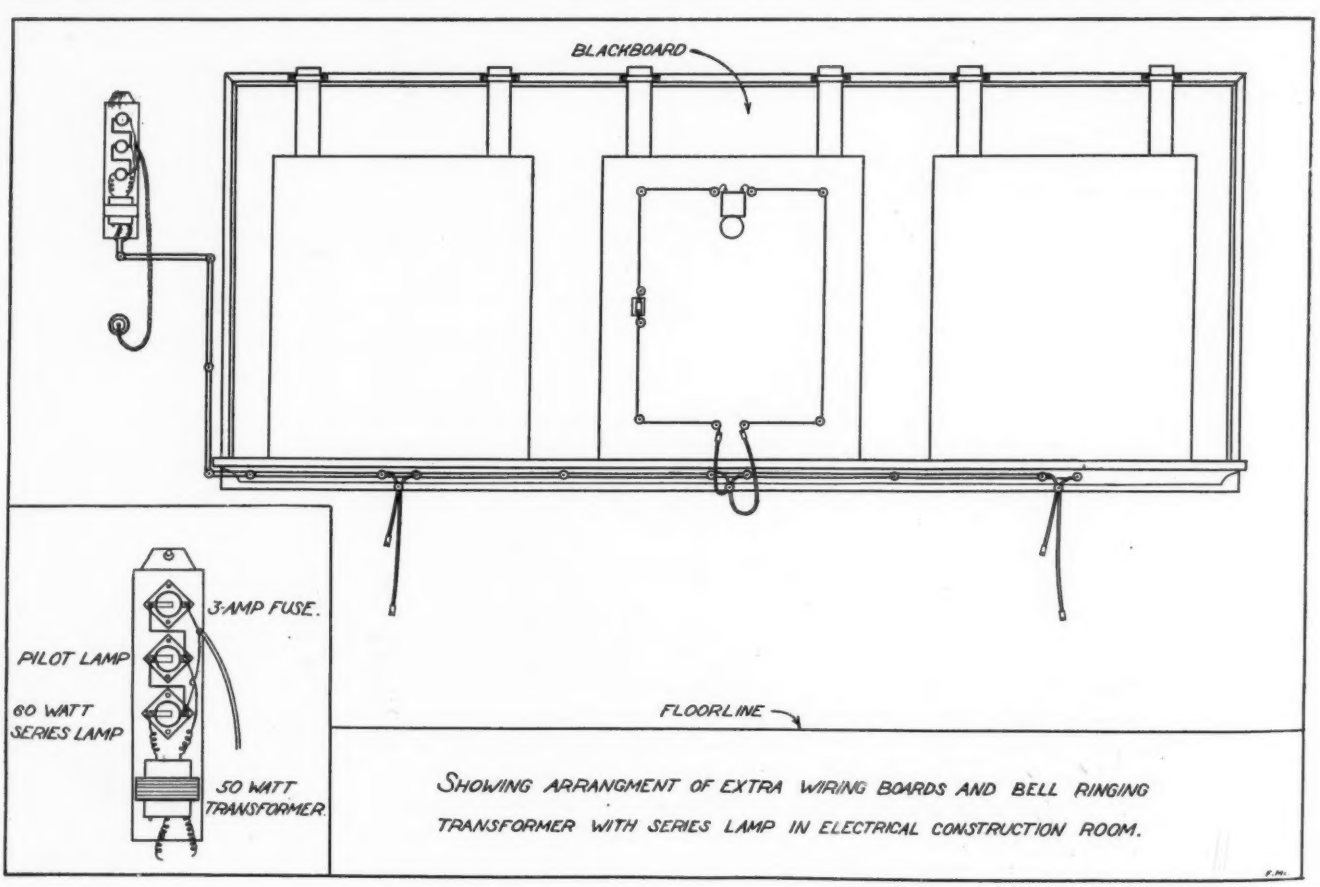
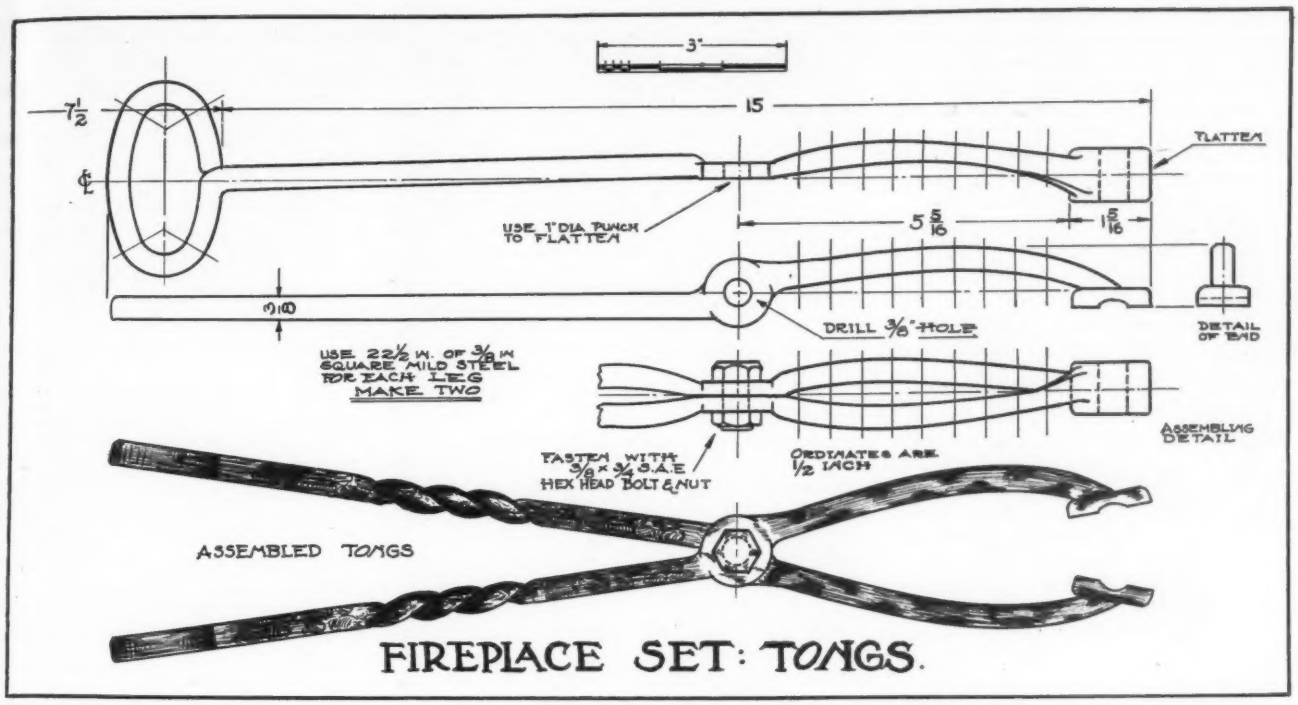

BLACKBOARD
3 AMP FUSE.
PILOT LAMP
60 WATT SERIES LAMP
50 WATT TRANSFORMER
FLOORLINE
SHOWING ARRANGMENT OF EXTRA WIRING BOARDS AND BELL RINGING TRANSFORMER WITH SERIES LAMP IN ELECTRICAL CONSTRUCTION ROOM.

*Fig. 1. Wiring boards temporarily mounted on blackboard*

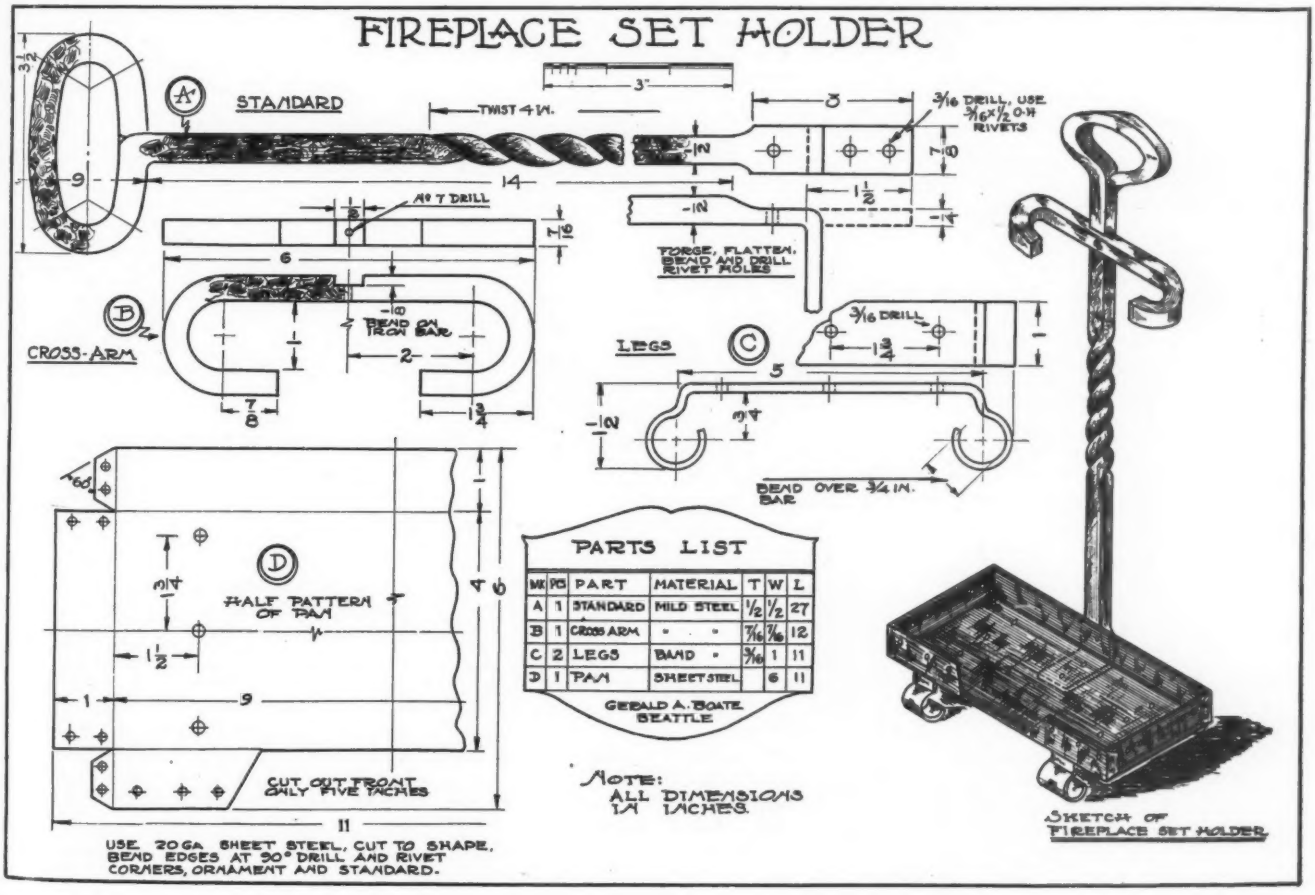



should be screwed down just tight enough so that the tongs will work freely. A slight cut with a cold chisel across both the nut and bolt end will keep the nut from loosening. The tongs should be peened to match the poker and shovel.

### The Holder for Fireplace Set

The set holder provides a compact and convenient receptacle for holding the poker, shovel, and tongs. When finished, it will appear as shown in the perspective sketch in Figure 2. The opening in the front is for dusting out the cleaning. The handles of the poker, shovel, and tongs may rest inside the open-link arm marked B, or the oval handles may be hooked over this arm.

Some of the rivets shown in the bottom pan are merely for ornament. If it is found


FIREPLACE SET HOLDER
STANDARD
TWIST 4 IN.
3"
3/16 DRILL, USE 3/16 x ½ O-H RIVETS
A° 7 DRILL
FORGE, FLATTEN, BEND AND DRILL RIVET HOLES
CROSS-ARM
BEND ON IRON BAR
LEGS
3/16 DRILL
BEND OVER ¾ IN. BAR
HALF PATTERN OF PAN
CUT OUT FRONT ONLY FIVE TACHES
USE 20 GA SHEET STEEL, CUT TO SHAPE, BEND EDGES AT 90° DRILL AND RIVET CORNERS, ORNAMENT AND STANDARD.
PARTS LIST
MK | PC | PART | MATERIAL | T | W | L
A | 1 | STANDARD | MILD STEEL | ½ | ½ | 27
B | 1 | CROSS ARM | " " | 7/16 | 7/16 | 12
C | 2 | LEGS | BAND " | 3/16 | 1 | 11
D | 1 | PAN | SHEET STEEL | | 6 | 11
GERALD A. BOATE SEATTLE
NOTE: ALL DIMENSIONS IN INCHES.
SKETCH OF FIREPLACE SET HOLDER

that the base of the set holder is too light, lead weights may be fastened at the bottom with screws. The operations entailed in this job are easily discerned after studying the illustration. The pieces are all to be peened to match the other parts of the set after which the metal may be brushed up with steel wool, bringing out its natural beauty. Parts may then be varnished with a high-grade nonlustrous varnish, or they may be given several coats of liquid floor wax, after application being brushed to polish.

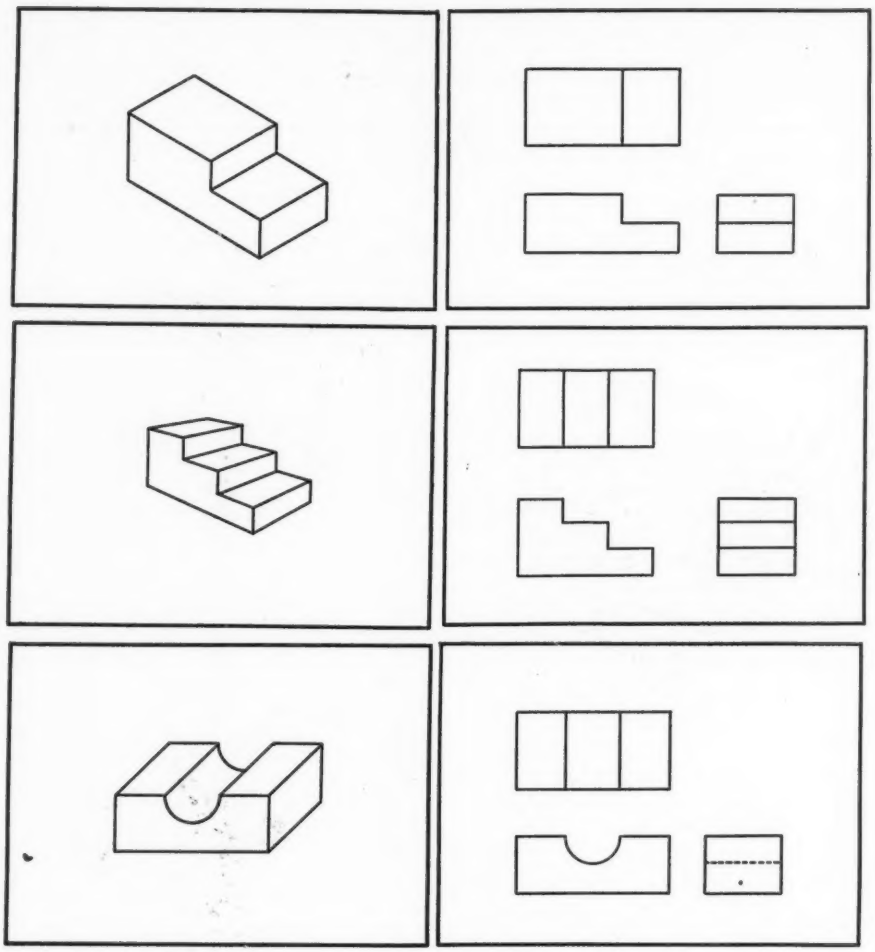
## FLASH CARDS FOR MECHANICAL-DRAWING CLASSES

**R. R. Bedker, High School, Wauwatosa, Wisconsin**

The flash cards described herewith have been used with success in the drawing classes of the Wauwatosa High School. The cards are made on 8¾ by 11¾-in. heavy manila paper. On one side is an oblique, isometric, or perspective drawing of an object and on the other side a 2- or 3-view orthographic drawing. The scheme may be extended to include other phases of mechanical drawing, such as auxiliary views, sections, and the like.

The flash card is a great timesaver and organizer for the short mechanical-drawing period. One or more of these flash cards showing an oblique, isometric, or perspective drawing are placed in the front of the room at the beginning of the period. The students will become accustomed, in a short time, to making 2- or 3-view orthographic drawings in their sketchbooks from the flash card or cards shown. Then, after a few minutes, the instructor reverses the card or cards so that the correct orthographic views are shown, thus giving the student an opportunity to check whatever mistakes he may have made in his drawing. The process may also be reversed by having the student make oblique, isometric, or perspective drawings from the orthographic views.

In this way, a 5 to 10 minute sketch drill may be given daily. The flash cards permit the showing of the orthographic drawings in four different positions. Position No. 1 shows the top, front, and right end views. Turning the card clockwise to position 2 gives front, bottom, and right end views. Position 3 shows front, left end, and bottom views. Position 4 shows top, front, and left end views. Oblique drawings may also be shown in four different positions. For this purpose, it is best to make these drawings at an angle of 45 deg. Perspective and isometric drawings may be shown in two different positions to advantage, that is, above and below eye level.



*Front side* *Reverse side*

### Advantage of the Flash Cards

*Visual Aid*

1. Focuses the attention of the group upon a given mechanical drawing.
2. Gives practice in rapid visual recognition of drawings.

*Drill Aid*

1. Provides drill on specific mechanical drawings. For this purpose drawings should be selected that need drillwork.
2. Repetition can be provided according to the need of the group or of certain individuals.
3. Contest or game ideas may be used for motivation.
4. Provides convenient form for giving mechanical-drawing drill on desired elements.
5. Presents one situation at a time to the student.
6. Gives opportunity for individual or for group work.
7. Provides for an exposure of limited time which is considered desirable in drillwork.

*Testing Aid*

It is easy to test a group or an individual on any type of drawing by means of these flash cards.

### How to Make the Charts

It has been found that a speedball pen No. A-3 gives a good width of line that is easily visible in the average drawing room. Speedball pen A-2 may be used for the borders to give contrast. For making arcs and circles, the regular compass pen may be used for drawing an inner and an outer arc or circle, leaving the space between the two lines equal to the width of the straight lines used. This space may then be filled with a speedball pen or in some other way.

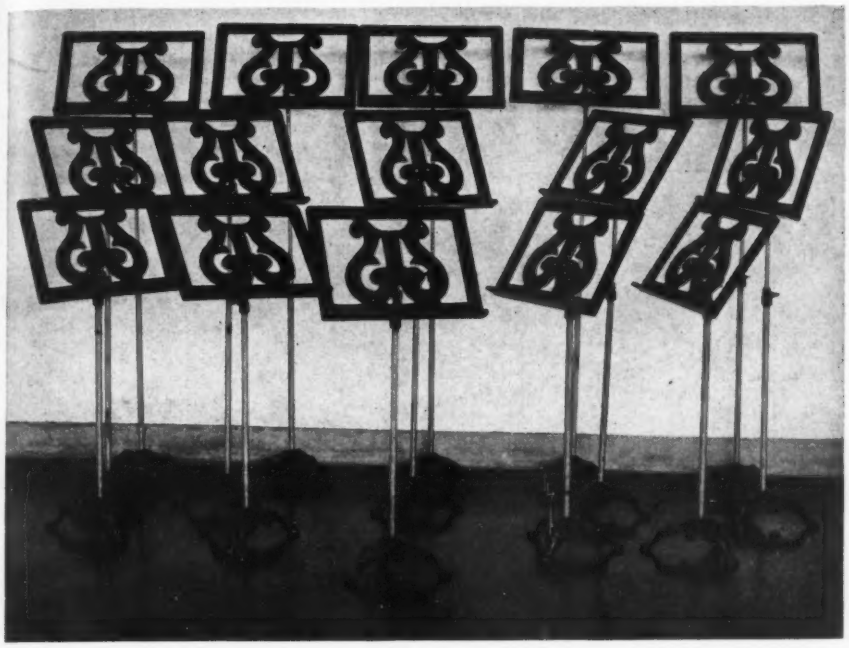
## PRODUCTION WORK IN THE SCHOOL SHOP

**George C. Donson, Washington, Pennsylvania**

The question of production work in the school shop has been the subject of many debates among industrial-arts teachers. Some of the objections raised against production work are:

1. It upsets the shop program and disrupts the course outline.
2. It usurps the time of the teacher who must make jigs and perform skilled operations too difficult for his students. This requires so much of his energy that little or no time is left for teaching.
3. All the teacher gets out of production "is just a lot of grief."

Opinions differ and there are many industrial-arts teachers who are heartily in favor of production work. Most of these argee that the work should be for the school, that it should be done during the regular shop period, and that it should not be too much of a hurry-up job. The best advertisement for a school shop is to have a principal or a superintendent, when he is showing visitors about the school, say, "Now this is the product of our boys in the shops. You will notice that the product shows careful training and work



*Music stands made in the general shop at Washington, Pennsylvania*

on the part of teacher and pupil. Our boys take great pride in doing jobs of this kind."

An example is worth a thousand arguments. During the past term, 45 music stands were made in our general shop, and while most of the work was done by the 9A boys, a number of 9B boys also had part in the work. The work required a few patterns and a few jigs, all of which were made by the boys. As problems arose in the course of the work, they, too, were solved by the boys. For instance, the base of the stand must be drilled and tapped for ½-in. conduit so that the piece of conduit will stand exactly plumb.

Two students made a device which would hold a ½-in. pipe tap and fit the spindle of a drill press so that the base was drilled and tapped in the drill press. Two other boys made a device for cutting threads on the conduit so that they would be straight. This device consisted of a drill sleeve turned to fit the guide ring of a pipe diestock, and the cutters were reversed. The thread cutting was done on the lathe by power and by hand.

The tops of the stands are made of ½-in. birch plywood. These required the use of the scroll saw. Some teachers ask, "What do you get out of production work?" Well, we got a scroll saw and 60 boys were trained to use it, sawing the 45 tops. Incidentally, ten of these boys got scroll saws for Christmas.

A system was worked out for assembling, sanding, painting, and finishing the birch tops. For staining the tops, the boys made a pan of galvanized iron, so that the tops could be dipped.

The production work created great interest among the boys, gave them some knowledge of actual production methods, and was the means for giving them some vocational-guidance information.

## LINOLEUM-BLOCK CUTTING IN THE DRAFTING ROOM

**F. M. Keith, Public Schools, Fort Smith, Arkansas**

Linoleum-block cutting exerts a broadening influence because it allows a great amount of originality in design. Because of its low cost, it may be made to play an important part in the publishing of school papers, yearbooks, programs, posters, and the like. It also provides a means for interrelating the work of several departments, and thus helps to create a better understanding between the industrial-arts department and the academic department of the school.

*Fig. 1*

The accompanying prints give some indication of the variety of linoleum-block cuts that were used in one school year.

At the beginning of the year, the journalism class needed a tint-block design to be used as a front-page background for the school paper which had been named *The Grizzly*. The bear head, shown in Figure 1, was accepted and met with such approval that the yearbook staff used it on a panel sheet in their publication *The Bruin*. Since the first edition of the school paper, requests for cuts have come in regularly from many of the different departments.

*Fig. 2*

The football-action cut, Figure 2, was used throughout the season on posters and handbills, and proved to be a great saving to the athletic department. This cut shows what may be done with a combination of fine lines and deep shadows.

The boy with the Christmas tree, in Figure 3, was used in the Christmas edition of the

*Fig. 3*

school paper. Christmas greetings in text type, used in conjunction, made this a very attractive cut.

The cut shown in Figure 4 was used on handbills in advertising activities of the many different school organizations. The printed matter was placed inside the billboard, and the whole layout proved to be an attention-getter.

The George Washington cut shown in Figure 5 was used in the junior-high-school paper for February 22. This cut shows what may be done with fine lines.

Figure 6 shows the cut that was chosen for the Easter edition of the school paper.

The feather with the word "Please," shown

in Figure 7, was used in a community-chest campaign, The school contributed the printed matter for the campaign and linoleum-block cuts were used in making charts, graphs, and decorative designs. The official emblem of the campaign was a red feather, and the print

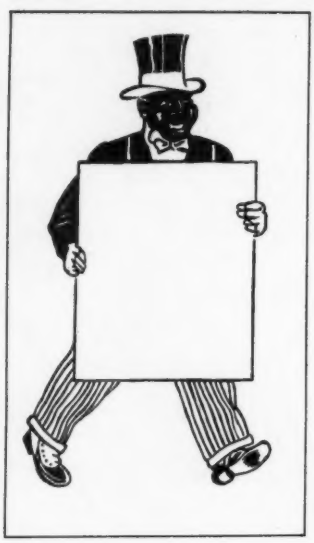


*Fig. 4*

*Fig. 7*

shown was in red ink and was very effective in securing contributions.

All cuts were mounted as shown in Figure 8, in our woodworking shop; and they were used on a cylinder press and on a platen press with equal success.

This practice of designing linoleum cuts in the drafting room has served to establish a contact between the drafting room and the printshop that had not been previously known in this school. The two departments are now in close harmony in matters related to printing design and layout.

Of equal importance is the fact that this work has paved the way to intimate relations between the drafting department and the

*Fig. 5. George Washington*

*Fig. 6*

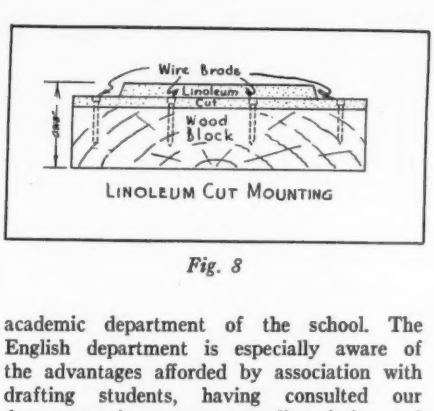



*Fig. 8*

academic department of the school. The English department is especially aware of the advantages afforded by association with drafting students, having consulted our department in matters regarding design and layout for publications, notebooks, stage settings, and decoration for dramatics, etc.

## HOW TO MAKE A METAL PICTURE FRAME

**L. C. Petersen, State Teachers College, Carbondale, Illinois**

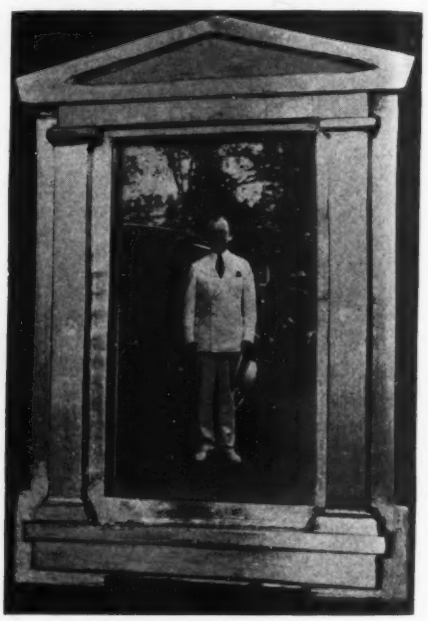
The picture frame illustrated and described in this article was designed for a picture 3½ by 5½ in. The frame may be made to suit a picture of any size, however. It makes an excellent shop project, as it offers experience in a variety of fundamental operations. Besides this, the frame possesses student interest and appeal.

*Problem:*

1. To make the drawing of the frame.
2. To make a pattern for it.
3. To mold the casting.
4. To mount the picture.

*The Drawing:*

Make a full-size drawing of a frame to fit a chosen picture. The picture-frame opening should measure about ¼ to ⅜ in. less than the size of the picture. This is drawn first,



*Cast aluminum picture frame*

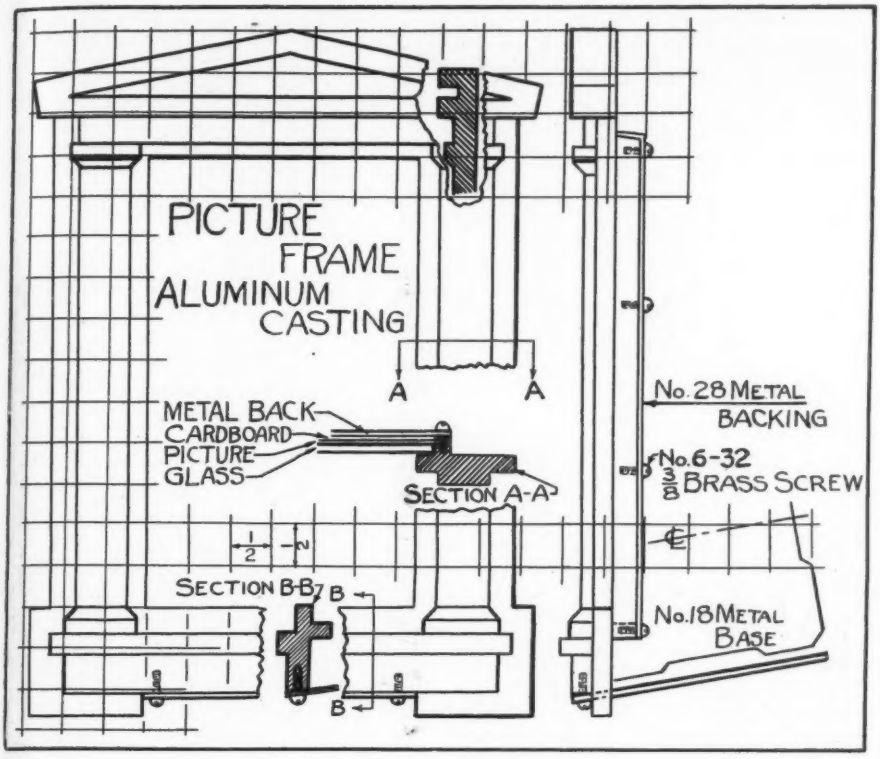
then the rest of the frame is designed around it.

*The Pattern:*

Transfer the shape of the frame to a piece of ¼-in. soft wood. Use a coping saw or a scroll saw for cutting the wood to shape. As the front face of the frame will be the parting line, make the draft on the edges accordingly. Cut out and shape the parts used for the pedestal columns, frieze, and cornice, and fasten these in place with brads. The strips that enclose the glass on the back are spaced 3/16 to ¼ in. from the opening to give bearing to the glass. Test all parts with a try square for proper draft. Sand all parts smooth and apply two coats of black shellac, sanding after each coat.

*Molding the Casting:*

Invert the drag portion of a flask and place it on a molding board. Then place the pattern face down on a molding board and sift parting sand over the pattern. Next, sift new molding sand over the pattern to a depth of about 1¼ in. Tuck the sand in around the pattern with the fingers, then fill the rest of the flask with molding sand, and, with the peen end of the bench rammer, ram first around the sides of the flask and then around the pattern. Be careful not to strike closer than 1 in. from the pattern. Finish the ramming of the drag with the butt end and strike off all loose sand with a straightedge. Next, put on a follow board, turn over both boards




*Picture-frame details*

and the drag, and remove the molding board. Cut away and smooth the sand to the parting line. Then put the cope in place and sprinkle some more parting sand over the molding sand in the drag. Keep the face of the pattern clean, Place the sprue pin about ½ in. from the pattern. Sift clean sand to cover the pattern as directed before. After this has been tucked in with the fingers, fill up the cope with sifted molding sand, ram it, and even off the top.

Next, lift off the cope and stand it on its side. Examine the mold and repair where necessary with moist sand. Make vent holes with wire through the cope sand to help the gases to escape. Remove the sprue pin and round off the top of the sprue hole to a funnel shape for pouring the metal.

To remove the pattern from the drag, drive a pointed wire into the pattern, and rap the wire on all sides so as to loosen the pattern sufficiently so that it may be lifted out without damaging the mold. Cut one or two shallow trenches in the sand, from the mold to the depression made by the sprue pin, so that the metal will have free passage to the cavity in the mold. Replace the cope on the drag, and clamp or weight it down without obstructing the vent holes.

To melt the metal, use an iron or graphite crucible of sufficient capacity to contain enough aluminum to fill the mold. The aluminum pigs may be bought. This may be melted either over a coal fire or by means of a gas flame. The melting process may be started at the beginning of the molding operation so that the metal is ready for pouring when the molding is finished. The metal must be brought up to a melting heat and kept covered to prevent oxidation. It should be poured into the mold rapidly and allowed to cool before removing the casting from the sand.

After the casting has cooled off, saw off all projecting parts and smooth up the rest with a file. The entire frame may then be polished with fine paper. Drill and tap the back for 9 No. 6-32 brass machine screws. Fasten a heavy sheet-metal base to the bottom as shown in the illustration. Also, cut the metal backing to size and drill holes for the screws. Bend the top end to fit over the glass and picture. Cut the glass to size, clean it, and put into place. Next, insert the picture. Place cardboard over it and lastly fasten the metal back in place with the screws.

## FUTURE CRAFTSMEN OF AMERICA

### Organization and Purposes

1. The Future Craftsmen of America is an organization of youth operating through the public school system of the United States for the promotion of the spirit of craftsmanship. It will operate through clubs or chapters located in schools offering instruction in craftsmanship. Local chapters will be affiliated in state chapters, and the several state organizations will affiliate in the National Chapter of the Future Craftsmen of America.

2. The main purposes of the organization may be briefly stated as follows:

*a*) To promote the spirit of craftsmanship.

*b*) To provide opportunity for experience in leadership.

*c*) To encourage interest in hobbies and leisure-time activities involving craftsmanship.

*d*) To aid the student in the intelligent choice of an occupation.

*e*) To increase knowledge of industrial organizations, the interdependence of workers, trade ethics, and safety.

*f*) To promote thrift generally through the intelligent use of the products of industry and through the wise use of educational and training facilities.

*g*) To motivate a studious attitude among youth interested in craftsmanship.

*h*) To assist the student in the transition from school to work.

*i*) To promote fellowship among the youth interested in industrial education.

3. *The Future Craftsmen of America is strictly a boys' organization* with a limited adult sponsorship, selected from public-school teachers and officials interested in craftsmanship. The Future Craftsmen of America is intended to serve industrial youth in a similar way to that which the Future Farmers of America serves agricultural youth.

4. *A system of degrees or awards* for achievement in craftsmanship will be provided. These awards will be based upon personal qualities, qualities of character, attainment in leadership, practice of safety, and skill in the crafts including technical knowledge.

5. *The personal qualities* to be emphasized will be character and social insight, leadership, and safety. The character of the true craftsman is exemplified by the ancient concept that "The Gods See Everywhere."

6. *Participation in public affairs encouraged.* The organization provides opportunity for the development of such social requirements of conversation, public speaking, and the proper conduct of an individual in a group. It gives practice in civic participation by providing a program which is local, state, and national in scope. This organization provides the opportunity for young men, in company with their adult sponsors, to learn to do by participation in community projects.

7. *The responsibility of leadership impressed upon youth.* The Future Craftsmen of America will serve as an integrating force in challenging youth to exert his influence for high social purposes. The problems of both employers and workers will be studied by youth to assist them in their social adjustment.

8. *The obligation of safety exemplified.* The importance of safety in work and in civic life will be emphasized by the Future Craftsmen of America through requirements for degrees. The ideal that "I am my brother's keeper" will be conveyed by appropriate ritual and symbolism.

9. *The craft spirit is revived.* Another function of the organization is the revival of the craft spirit among American youth. The Future Craftsmen of America will encourage the development of this spirit among boys through local school programs. It will recognize and give social prestige to individuals who have produced distinctive work in any craft.

# · NECKERCHIEF · · · · · SLIDES · · · · ·

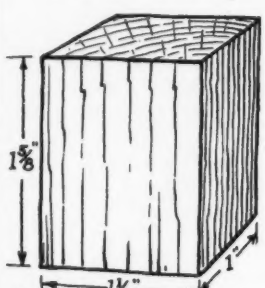
PLATE BY W. BEN. HUNT · · · HALES CORNERS, WIS.

*Beads are staggered as shown and threads are fastened at ends only.*

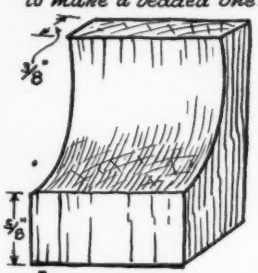


*The slides shown at the left & right were made by Indians. The structural parts of these slides are neck vertebræ of sheep and cows. A little whittling forms the horns and ears. The head proper is then covered with cloth or thin buckskin and then covered with beadwork. These vertebræ are rather scarce, because when animals are butchered by white men, they are split down the full length of the backbone, thus splitting these vertebræ. But boys can whittle these cow's head slides of wood, paint them carefully and have something unique in about one quarter of the time it takes an Indian to make a beaded one.*

DON'T try to whittle with a dull knife !

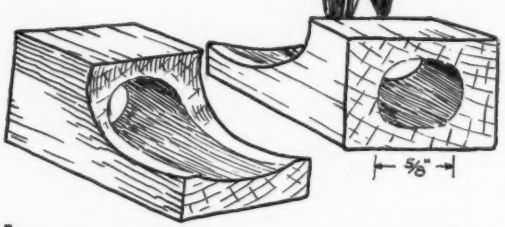



**1** *Block of well seasoned, straight grained bass or pine.*

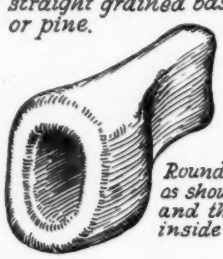



**2** *Cut as shown above*

[ *These dimensions may be changed slightly.* ]

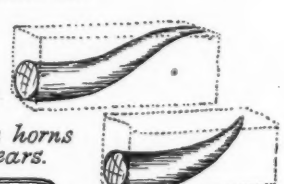



**3** *With the small blade of a pocket knife whittle out the hole as shown above. Do not try to bore it out with a bit as it is apt to split the block. 3 or 4 small holes may be made with a ¼" drill and then the remainder whittled out.*



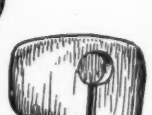
**4** *Round off edges smoothly as shown in these sketches and then sandpaper inside and outside.*

NECKERCHIEF SLIDE *when finished.*



**5** *Whittle horns and ears.*

*Back View.*



*Side View showing mortise.*

**6** *Cut mortises to fit and glue them in place.*

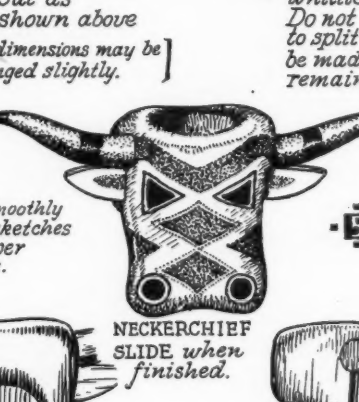
For a durable finish use enamel or lacquer. Any bright color may be used depending on individual taste. Both inside and outside should be painted to prevent moisture from causing subsequent splitting

For a quick finish these slides may be finished by painting the designs with poster water colors, and when thoroughly dry, they should be given one or two coats of varnish or white shellac.

## A CROW'S SKULL NECKERCHIEF SLIDE



*With a small knife blade scrape the skull carefully inside & outside. Cut away the inner walls of the eye sockets where shown with dotted line. Enlarge the neck opening also.*

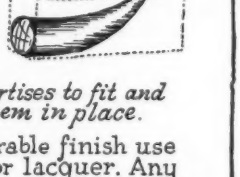


*If the skull is not already dry hang it in a dry place for a couple of weeks. Do not try to boil it, as the beak may become loose and slip off.*

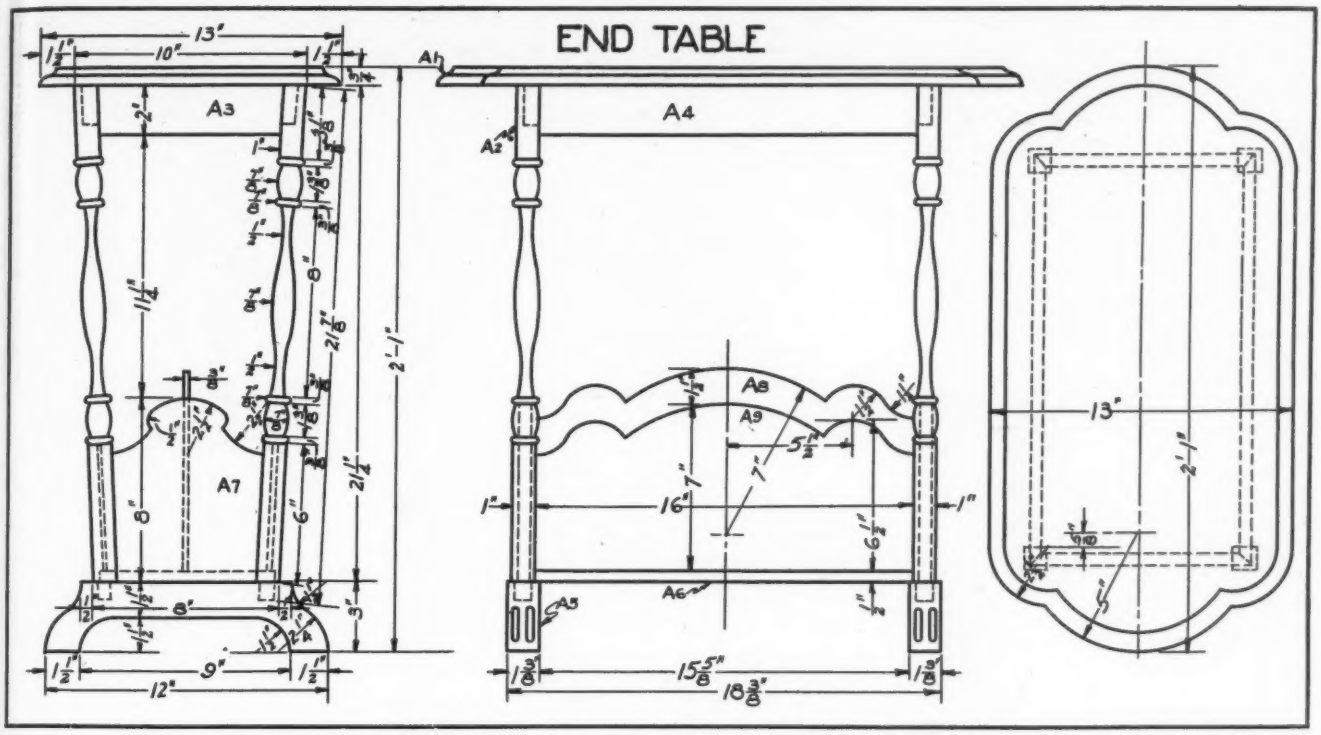
*When perfectly dry, trim and scrape again so that no dried flesh remains. Scrape the beak carefully & polish it with oil or wax.*

*Then give the skull (not the beak) two coats of white, yellow or blue lacquer and decorate to suit.*

*Ends of neckerchief may cross thru or go down straight on either side*



—Huh ?




*End table designed by Allen Winegard, Roslyn, Pennsylvania*

## END TABLE

**Allan Winegard, Glenside-Weldon Junior High School, Roslyn, Pennsylvania**

The end table described herewith may be made of walnut and finished with a rubbed varnish finish. The following is the list of material required:

**Bill of Material**

| *Part No.* | *No. Required* | *Name* | *Material* | *Size* |
|---|---|---|---|---|
| A1 | 1 | Table top | Walnut | 13 x ¾ x 25 |
| A2 | 4 | Legs | Walnut | 1 x 1 x 21⅞ |
| A3 | 2 | Rails | Walnut | 2 x ½ x 9 |
| A4 | 2 | Rails | Walnut | 2 x ½ x 17 |
| A5 | 2 | Feet | Walnut | 2 x 1⅜ x 12 |
| A6 | 1 | Bottom | Walnut veneer | 7½ x ½ x 17½ |
| A7 | 2 | Ends | Walnut | 6½ x ½ x 8 |
| A8 | 1 | Side | Walnut veneer | 8½ x ⅜ x 16½ |
| A9 | 2 | Sides | Walnut veneer | 7 x ⅜ x 16 |

## RECIPE RACK

**Dale E. Mansperger, High School Rittman, Ohio**

Variety in prepared foods should be easily obtained if one may judge by the wealth of recipes which have been and are being published. "Where shall I place the recipe?" is the problem of the culinary artist as she sets about to prepare a tasty bit of food for a meal. It was to solve a common home problem by a metalworking project suitable for industrial-arts classes that the *recipe rack* was designed.

It is necessary, in order to use the recipe rack, to write or type favorite recipes on index cards of convenient size. The size used with this rack is a standard 4 by 6-in. card. The dimensions may, however, be adjusted to a 3 by 5-in. card. The rack is fastened in a convenient place in the kitchen and one or more recipe cards slipped into it.

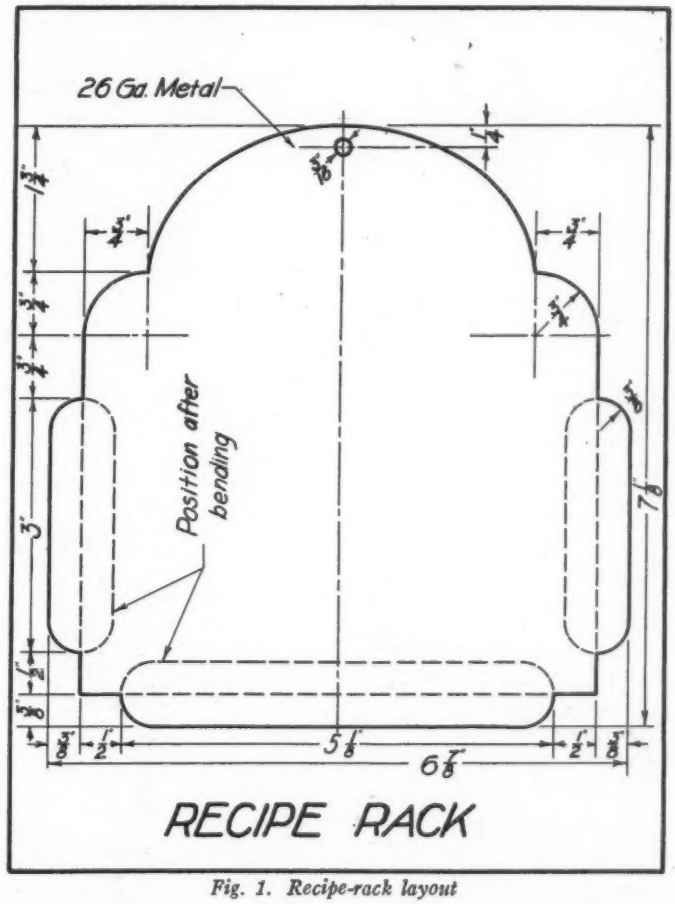



*Fig. 1. Recipe-rack layout*

The construction details are rather simple, since there is only one piece of metal. The project, therefore, is suitable for a beginning metalworking class. The metal should be laid

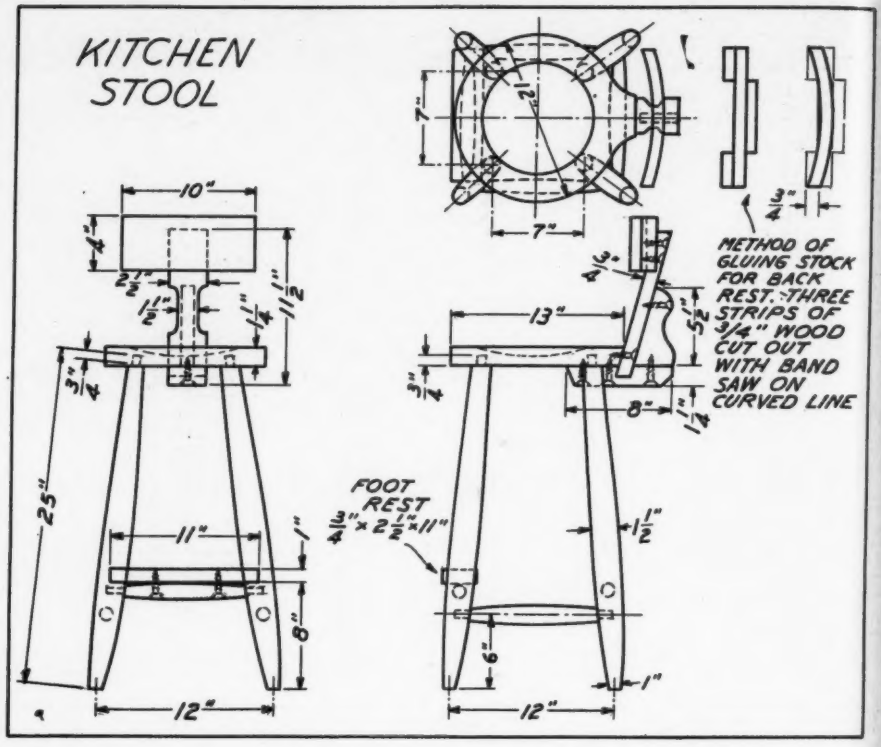
out and cut according to the illustration in Figure 1. In order that clearance may be provided for the recipe card, a piece of metal should be clamped under each of the three folds on the front of the rack before they are bent. A piece of 18-gauge metal, 4 by 6 1/16 in., may be clamped in the card position and all of the folds bent over it. In addition to an enamel finish, decoration may be obtained by a transfer picture which is adapted to the kitchen.

## KITCHEN STOOL

**Louis Barocci, High School, Cudahy, Wisconsin**

The kitchen stool described herein should be made of a strong, sturdy wood such as maple, birch, or oak. A large number of tool operations are employed in its construction

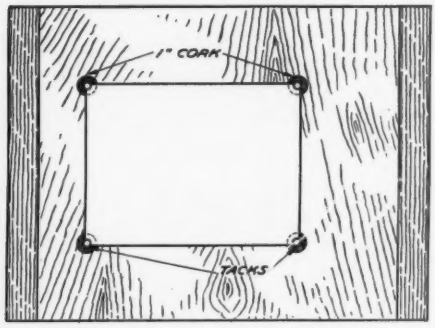
as well as the use of several shop machines, turning lathe, and band saw. The stool is finished in color to match the kitchen where it will be used. White with red trimmings will be found to be in great favor.




## ELIMINATING THUMBTACK HOLES IN THE DRAWING BOARD

**Clarence G. Nyhus, Stanwood Union High School, Stanwood, Washington**

After a drawing board has been in service for a year or so, its working surface will be found pitted with thumbtack holes. This condition may be eliminated by drilling holes of approximately 1 in. in diameter on the drawing board at the corners of a rectangle of the size of the drawing paper to be used.




These holes are then to be filled with corks, glued in place and trimmed smooth with the surface of the drawing board. This will make the fastening down of paper and the subsequent job of thumbtack removal very easy. It puts an end to drawing-board spoilage, and the corks can be replaced whenever that seems necessary.

# Answers to Questions

### REFINISHING A GREASY TABLE TOP

1024. Q.: We have been asked to refinish an antique walnut table which apparently has spent many years in a kitchen, as the top is very much grease-soaked. How can we get rid of this grease so that we can refinish the table? — *E. G. D.*

A.: Dress the table on a planer, then sand clean. Next, make a thick paste of whiting and alcohol. Spread this evenly ½ in. thick over the greasy area and allow to dry. Then remove the paste, sand, and repeat. If this does not take out the grease, there is little hope for getting rid of it, and it is better to make a new top. The alcohol in the paste should saponify the grease while the whiting should absorb it as it is drawn from the wood. — *Ralph G. Waring.*

### FINISHING THE DEN

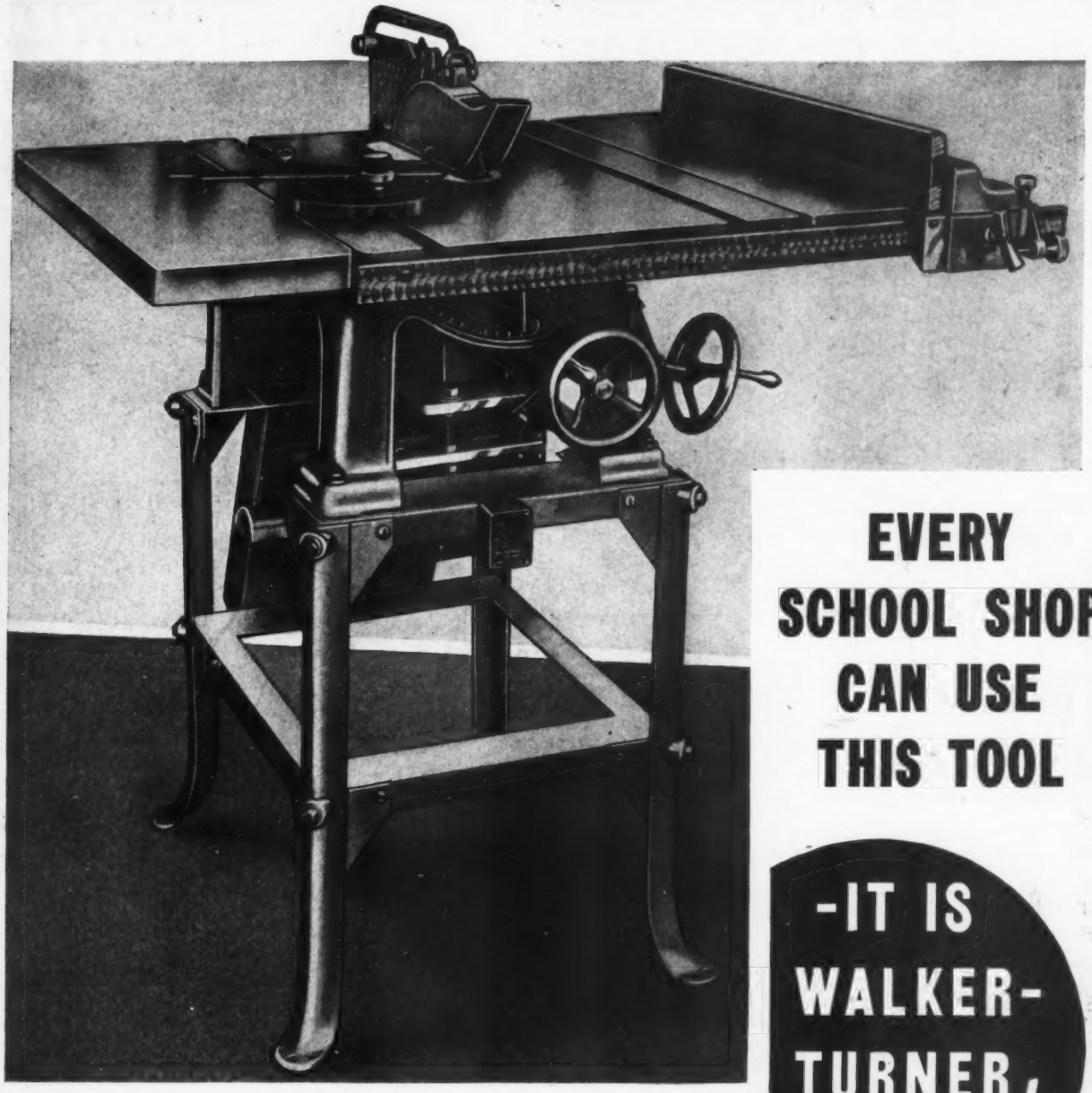
1019. Q.: I am about to add a small room, a sort of den or study, to my home. One end of the room will be completely covered by a paneled cabinet. I am a lover of Tennessee red cedar and am thinking of using cedar closet lining for the walls, cedar for trim and for the cabinet. The ceiling is to have panel effect by using celotex and cedar strips. My notion is to oil the door and window casings and the baseboard, then shellac all interior. What do you think the result will be? What finishing suggestions would you offer? How would you finish the celotex? What would you use for flooring and how finish? — *C. H. D.*

A.: The use of the Tennessee cedar for lining the room mentioned will be entirely satisfactory; except for one thing: the color of the wood will prove very difficult as a background for furniture and furnishings. Then, too, I am afraid that so much red, continued over a long period of time will prove rather irritating and will be quite lacking in the restful tones that should be present in a room of the type known as a study or den. If you will decide to go ahead with it after reading the above, then you can follow these suggestions:

Instead of oiling the doors and trim, use a good 4-hour varnish, like Pratt and Lambert No. 61, cut in half with gasoline. Do not use turpentine or you will get an entirely different result; and in any case, have the windows slightly open at the top and bottom to carry off the fumes quickly. It is preferable to do this in the summer time to avoid having any of the fumes reach the furnace or open gas flame, neither of which should be used at the time.

Shellac should not be used on red cedar of this type. Test panels exposed to light have developed a most displeasing undertone of gray on the part which has a priming coat of shellac; the half of the same panel with varnish is warm and rich,

(Continued on page 10A)



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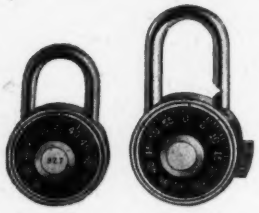

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(Continued from page 68)

entirely lacking the cold gray of the shellacked portion.

The second coat may be given after the first has been sanded with a 4/0 or 6/0 paper. The second coat should dry three days after which it is to be rubbed with 2/0 steel wool, and then wiped off with an oil polish. This whole process can really be done quite quickly as I have used it in residence work with entire satisfaction.

Paint the celotex ceiling with two coats of egg-shell paint preferably of a light ivory shade in order to give reflection and light which will otherwise be lacking in a room of this type. Why not use a 5- or 4-ft. dado of cedar paneling and a painted celotex panel above to meet the ceiling, rather than so much wood?

For the floor, I should use comb-grained pine or fir, which can readily be stained to harmonize with the woodwork. For the finish, I should use either two coats of thin shellac and wax, or what my experience has proved to be better in the long run: two coats of varnish, with the gloss knocked off the last coat with 2/0 steel wool and then waxed or oiled as may be convenient. The above assumes that the floor has been properly scraped and sanded. — *Ralph G. Waring.*

# Personal News

¶ Mr. A. C. Tagg, formerly a member of the faculty of the Fordson High School, Fordson, Mich., has been appointed state supervisor of the rehabilitation division, State Department of Public Instruction, Lansing, Mich.

¶ Mr. A. W. Pope and Mr. Max Hoffman have been appointed as research engineers on the faculty of the Mechanics' Institute of the Boys' Technical High School, Milwaukee, Wis. The additions to the faculty have been made necessary because of the inauguration of laboratory work and the installation of Diesel engines.

¶ Mr. Leo Grenier, of Southbridge, Mass., has been appointed as instructor in machine-shop practice in the Cole Trade School. He succeeds Lawrence Swenson.

¶ R. B. Martin has assumed the duties formerly held by A. C. Tagg, at the Fordson High School, Dearborn, Mich.

¶ Miss Mary M. Conway, one of Cincinnati's pioneer leaders in continuation school and vocational education and retired principal of the Cincinnati Sewing Vocational High School, died at her home in East Walnut Hills, after a month of illness, on November 24, 1936. She was the first principal of the Cincinnati Compulsory Continuation School in 1911.

# Association News

### THE 11TH A.V.A. CONVENTION AT SAN ANTONIO

With a large attendance of teachers, supervisors, directors, and teacher trainers interested in industrial arts and vocational education, the eleventh annual meeting of the American Vocational Association held its opening session, December 2, 1936, at 8 p.m. at the Plaza Hotel at San Antonio, Texas. J. C. Cochran, Superintendent of Schools, San Antonio, was the chairman.

Speeches of welcome were given by George Clark, who substituted for Governor James V. Allred; Gordon Worley, who substituted for L. A. Woods, State Superintendent of Public instruction, Austin, Tex.; Ray L. Martin, State Director Vocational Education, Austin, Tex., and L. W. Fox, Assistant Superintendent in charge of Vocational Education, San Antonio. The response was made by George P. Hambrecht, President of the American Vocational Association.

There were the usual speeches of welcome, after which A. H. Hughey, Superintendent of Schools, El Paso, Tex., gave the principal address. He spoke in place of John W. Studebaker, U. S. Commissioner of Education, U. S. Office of Education, Washington, D. C., who found it impossible to be present. In his address, Superintendent Hughey stressed the duty of the school to help youth fit itself to grasp opportunity when it is offered. He pointed out the fact that while there is a shortage of skilled labor right at the present time, there are still thousands of youths between the ages of 16 and 25 who are unemployed.

The annual banquet, held Thursday evening at 6:30, also was a huge success. George P. Hambrecht, President, American Vocational Association, presided. There were numerous prominent guests. Herbert Heilig, Director, Vocational Education, Appleton, Wis., and E. L. Williams, Head, Department Industrial Education, A & M College, Station, Texas, reported on the numerous A.V.A. life memberships taken out during the year.

Of course, during the four days of the convention, there were so many sectional meetings for those interested in agricultural, commercial, home-economics, industrial-arts, industrial, rehabilitation, and part-time education, as well as in the National Youth Movement, guidance, and teacher training, that it is impossible to give any kind of report which would be satisfactorily comprehensive.

Some attempt was made to integrate some of the interests of those who attended, by holding combined sessions in which agricultural, commercial, home-economics, industrial-arts and

(Continued on page 12A)

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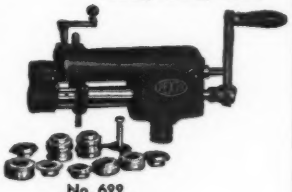

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(Continued from page 10A)

industrial-education sessions were represented. One of these was held on Thursday, December 3, at which Arthur K. Getman, State Supervisor Agricultural Education, Albany, N. Y., presided. Irvin S. Noall, State Director Vocational Education, Salt Lake City, Utah, the first speaker on this combined program, pointed out that great progress has been made in science and in the application of science to industry, but that we had not as yet succeeded so well in our study of human relationships. The school must see that youth get training that will make them good members of society; vocational education must be better developed than it is at present, and schools and industry must work together to this end. Earl W. Barnhart, Chief Commercial Education Service, U. S. Office of Education, Washington, D. C., called attention to the fact that the vocational school must plan for the future. "To do effective work," he said, "trends must be studied, and future events correctly foreseen. Commercial schools at present are producing thousands of stenographers and bookkeepers who will never be employed at these occupations. It is folly, also, to place so much emphasis on these studies in rural high schools. The commercial training of the future must prepare for commercial service, as most of the graduates of commercial schools go out into general clerical positions. Students in rural areas need different courses than those in metropolitan areas, and courses in smaller towns hear metropolitan areas need still another type."

Dr. Homer J. Smith, Professor of Industrial Education, University of Minnesota, Minneapolis, Minn., read an excellent paper in which he thoroughly analyzed what the industrial arts offer in the field of general education.

A. B. Mays, Professor Industrial Education, University of Illinois, Urbana, Ill., stated that the industrial arts made more genuine educational progress than was made in any other educational field during the last 15 years. He said further that industrial arts can express more nearly what education now is attempting to do, than can the social-science subjects or any of the other subjects now taught.

(*To be continued*)

## WISCONSIN INDUSTRIAL ARTS ASSOCIATION MEETS

The Wisconsin Industrial Arts Association held its annual meeting in conjunction with the convention of the Wisconsin Educational Association, Thursday, November 5, 1936, in the Juneau Hall of the Milwaukee Auditorium. Roy A. Radtke, president of the Wisconsin Industrial Arts Association, was chairman. Clyde A. Bowman, Dean, School of Industrial Education, The Stout Institute, Menomonie, reported on the survey of industrial arts in Wisconsin made by the Association with the co-operation of the State Department of Public Instruction. A. B. Mays, Professor of Industrial Education, University of Illinois, Urbana, Ill., gave the main address. He spoke on "Industrial Arts in the New Curriculum." A copy of his speech appears on page 35 of this issue. At the business meeting, the following were elected as officers for the coming year: President, H. J. Schufeldt, Racine; vice-president, Leo R. Ebben, instructor, Kohler; permanent secretary, Roy R. Van Duzee, Supervisor Industrial Arts, West Allis; committeeman at large, T. A. Hippaka, Supervisor Industrial Education, Madison.

On Friday, November 6, at 2 p.m., the Wisconsin Industrial Arts Association held group meetings at the Boys' Trade and Technical High School. H. O. Griffith, printing instructor, Menasha public schools, was chairman of the printing section. Earl Harmes, supervisor of industrial arts, Shorewood public schools, was chairman of the cabinetmaking group; F. W. Ziegenhagen, Boys' Trade and Technical High School, was chairman of the millwork section; Alex Bick, instructor, Milwaukee public schools, was chairman of the metalwork section, and Harvey W. Waffle, instructor Waukesha public schools, was chairman of the mechanical-drawing section.

## VOCATIONAL EDUCATION AT THE WISCONSIN TEACHERS' ASSOCIATION CONVENTION IN MILWAUKEE

Vocational education in all its various phases was discussed at the Wisconsin Teachers' Convention, held on November 5, 6, and 7, in Milwaukee.

Mr. William F. Patterson, executive secretary of the Federal Committee on Apprentice Training, spoke on the subject of "Apprentice Training." He pointed out that attention is being increasingly directed to the need for skilled training in the industries, and showed that the curve of apprenticeship did not go down during the depression and that vocational education will continue to function as pre-apprenticeship training. Mr. Patterson predicted that the country will eventually witness a large increase in the number of indentured apprentices and a gradual refinement in the apprenticeship program.

Dr. C. A. Prosser, of Minneapolis, Minn., a pioneer in the field of vocational education, spoke at one of the general sessions, choosing as his subject, "Vocational Education as Life Adjustment." He discussed situations affecting the problems of the vocational school and the responsibilities of the instructor, the supervisor, the director, local and state boards, and the Federal Board.

Mr. Charles Kruse, of the Milwaukee Vocational School, gave demonstrations of recent developments in the field of electrical science. The stroboscope and black light were used to prove that "seeing is not always believing."

A number of round-table sessions were held in connection with the meeting, taking up particularly work in the building, metal, and printing trades, in English, vocational guidance, related subjects, and social science.

## WISCONSIN PRINTING TEACHERS FORM ASSOCIATION

The printing teachers of Wisconsin have recently completed the formation of a state-wide organization. The first meeting of the Association was held at the Boys' Technical High School, Milwaukee, during the state teachers' convention, and was attended by more than twenty printing teachers.

The arrangements for the organization were worked out under the chairmanship of Mr. H. O. Griffith of Menasha. The name of the organization is the Wisconsin Graphic Arts Teachers' Association.

Officers for the year 1936–37 were elected as follows: President, Mr. Harvard C. Smith, Kenosha; vice-president, Mr. Duane H. Brophy, Milwaukee; secretary-treasurer, Mr. Leonard A. Petersen, Green Bay.

Board of directors: One year, Mr. Harold O. Paciotti, Beaver Dam; three years, Mr. H. R. Johnson, Racine.

## NEW ENGLAND INDUSTRIAL-ARTS ASSOCIATION MEETS IN PROVIDENCE, R. I.

The New England Association of Industrial-Arts held its first annual convention in the Crown Hotel, Providence, R. I., on November 6, 1936. The Association was formed at a series of meetings held last year during the Thanksgiving recess. One hundred and fifty members attended the convention.

The program was opened on Friday, November 6, with President Feuerstein presiding. Following greetings given by Dr. James F. Rockett, an address was made by Dr. Royal B. Farnum, of the Rhode Island School of Design; Dr. Ernest W. Butterfield, of Hartford, talked on "A World of People and Machines."

Following the banquet on Friday evening, President Feuerstein welcomed those who had come from near and distant parts of New England. He introduced as toastmaster Mr. Raymond E. Perry, state supervisor of industrial education, and spoke in commendation of the work which Mr. Perry and his committee did in organizing the convention in Providence. Mr. Perry, who traced the historic development of industrial arts in New England, pointed to definite progress and showed that during the last fifty years, industrial arts has helped to adjust pupils to the economic and social changes which are characteristic of the times.

Dr. James F. Rockett predicted that industrial arts is leading other educational activities in holding the interests of youth through its activities and the unusual wealth of its subject matter. It is carrying out a well-rounded educational program in conjunction with the other school subjects.

Dr. Royal B. Farnum, speaking on the development of the industrial arts, pointed out that the rapid development of the work in this line may be attributed to the refining influences of artistic expressions in improving the appearance and worth of industrial products. Dr. Farnum gave as his opinion that this improvement in industrial products is bettering the lives of consumers who are being trained through industrial arts to find satisfaction in refined appearances.

Dr. Butterfield, speaking on the earlier education which trained youth to live in a world of books, fixed laws, and hard labor, pointed to the progress made in invention and gave many examples to illustrate what he said. He declared that the developments in education during the last three generations had been as dramatic as the changes which had come down through the years in the industrial products and their use. He showed that the schools direct the interests of boys and girls to the world of machines and people.

At the Saturday session, Mr. Edward C. Emerson, of Boston, speaking for Mr. Joseph Sandberg, gave an interesting talk on "Beginnings of Manual Training in Boston."

It was voted to hold the next meeting in Boston, on November 7, 1937.

The following officers were elected for the next year:

President, Mr. Arthur Feuerstein, Stamford, Conn.; vice-president, Mr. Herman Pohlman, Newton, Mass.; secretary, Mr. Willis B. Anthony, Fitchburg, Mass.; treasurer, Mr. Richard A. F. Ballou, Providence, R. I.

Second vice-presidents and state chairman; Maine, Mr. M. C. Verney, Augusta; New Hampshire, Mr. John Goddard, Nashua; Vermont, Mr. Henry B. Caswell, Burlington; Massachusetts, Mr. Joseph Lanza, Southbridge; Rhode Island, Mr. W. L. Schaller, Providence; Connecticut, Mr. John Cave, New Haven. — *Willis B. Anthony, secretary.*

## WESTERN ARTS ASSOCIATION CONVENTION

The next annual meeting of the Western Arts Association will be held April 14 to 17, in

(Continued on page 15A)

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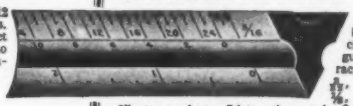

No. 97301—Made of best grade seasoned boxwood; machine divided, guaranteed accuracy, divided 1/32, 1/16, 1/8, 1/4, 3/8, 1/2, 3/4, 1, 1½, and 3" to a foot. List price each $.50. Same scale maplewood list price $.43 each. Prices subject to discount to educational institutions.

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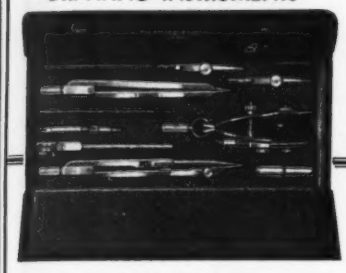

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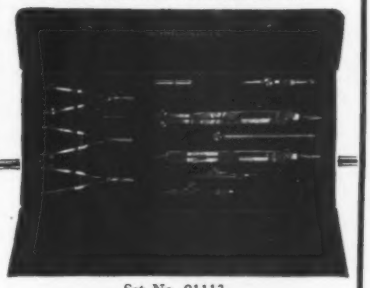

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(Continued from page 12A)

Toledo, Ohio. This promises to be not only the most interesting meeting but one of the largest in the history of the association.

## CENTRAL CONNECTICUT INDUSTRIAL-ARTS ASSOCIATION MEETS IN HARTFORD

The Central Connecticut Industrial-Arts Association held its regular fall meeting in the hobby shop of the Times Building, on Wednesday, December 9. About fifty members of the association were in attendance.

The meeting was opened by President Eugene Giammatteo, of Bristol, who spoke on the co-operation of the society with the Hartford *Times* in the operation of the hobby shop. Chairman Howard C. Wiley of the program committee introduced Mr. Joseph F. Weyand, financial advertising manager of the Hartford *Times*, and director of the hobby shop, who emphasized that the *Times* is anxious to co-operate in promoting the formation of all kinds of hobbies.

The speaker of the evening, Mr. Samuel Ludlow, of Hartford, gave an interesting and enjoyable account of his hobbies in the fields of radio, boating, household repair, cabinet construction, and painting. He emphasized that the schools should make industrial arts a required subject because the early years of school life are the best for acquiring the rudiments of skill in the trades. He pointed out that we are faced today with a new social and economic order and that all children are attending school for a longer period. The new order calls for increased activities along industrial-arts lines.

President Giammatteo presided at the business session. Reports were presented by the chairmen of the several committees and President McAndrews of the Connecticut Industrial-Arts Association, reported on the progress being made on plans for the state conference in April.

Mr. Raymond Phipps, of the State Teachers' College, New Britain, Conn., spoke on possibilities for exhibit space at the state conference. Mr. Albert Adams reported on the boat club being conducted at the hobby shop and the interest manifested in boat building. Arrangements were made for a birdhouse contest, to be conducted by the hobby shop.

The following officers were elected to the nominating committee which is to select the officers for the next year:

Chairman, Mr. John F. Malley, Hartford; Mr. Hosmer C. Jones, Sr., West Hartford; Mr. Fred Drabble, Jr., New Britain; Mr. Gordon S. Hill, Hartford; Mr. John C. Houdlette, Meriden.

## INDIANA INDUSTRIAL-EDUCATION CONVENTION

The Indiana Industrial-Education Association will hold its regular annual meeting on April 9 and 10, in Evansville. President Warren Pease is preparing the program for the meeting.

Information concerning the meeting and the speakers may be obtained by writing to Mr. H. G. McComb, secretary, at Purdue University, Lafayette, Ind.

## SOUTHEASTERN INDUSTRIAL-ARTS TEACHERS' CLUB HOLDS MEETING

The Southeastern Industrial-Arts Teachers' Club held its first meeting of the season at the Central Grammar School, Newburgh, N. Y., on September 29, with forty teachers from Orange and Rockland counties in attendance.

Following the supper, Principal Ira D. Minard gave an address of welcome, in which he traced the history of the Central Grammar School, erected in 1886. He showed that this school has always maintained a great interest in shopwork, which was started in Newburgh some 50 years ago. He pointed to the great opportunities for present teachers to carry on the work of the men who laid such a splendid foundation, giving tribute particularly to the loyalty and service of Mr. William Sanxy.

Mr. E. W. Thorpe, president of the club, conducted the business meeting, during which it was decided to hold the next meeting at Suffern, on October 20.

Mr. Linwood Sinnamon announced a "soapbox derby," and Mr. John Port promised the co-operation and the support of local automobile dealers.

At the close of the meeting, the visitors made an inspection of the school shops.

Mr. Fred Pelin and Mr. Van Tassel led in a discussion on the subject, "Objective Testing in Industrial Arts."

## NEW YORK STATE VOCATIONAL ASSOCIATION HOLDS ITS ANNUAL MEETING IN SYRACUSE

The New York State Vocational Association held its annual meeting December 28 to 30, in the Hotel Syracuse, Syracuse, N. Y.

The meeting opened on Monday morning, December 28, with discussions on "Outstanding Service," by Mr. Oakley Furney; "Liability Insurance," by Mr. Stanley Fitzgerald; and "Research in Social Subjects," by Louis Thornton.

On Tuesday morning there were talks on the subjects of teacher training, home economics, technical education, industrial education, agricultural education, commercial education, industrial arts, and vocational guidance. At the general

(Continued on page 17A)

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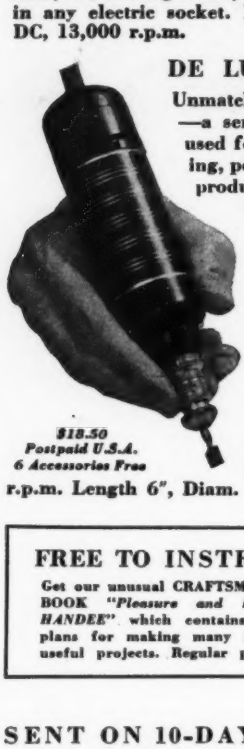

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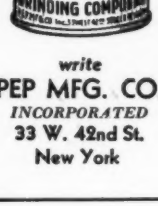

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(Continued from page 15A)

meeting there was a discussion of the George-Deen Law for Vocational and Allied Educational Programs.

On Tuesday evening the annual banquet and dance was held. Following the banquet, a medallion for outstanding service was presented to Miss Florence Marshall.

On Wednesday morning the subject for discussion was "The Integration of General and Vocational Education."

At the business meeting, the reports of the committees were read, a discussion of the next meeting place was held, and a report of the nominating committee was read.

### KANSAS VOCATIONAL TEACHERS MEET

The vocational teachers of Kansas held their annual meeting in Topeka, Kans., in connection with the meeting of the Kansas Teachers' Association. The meeting attracted a large attendance and the round-table sections were crowded to capacity. The breakfast meeting, which was addressed by Dr. Homer J. Smith, had an attendance of two hundred teachers.

The highlights of the meeting were the addresses on Saturday, November 7, which attracted favorable comment from those in attendance.

The officers elected were:

President, Mr. C. O. Banta, Ottawa; secretary, Mr. W. W. Scott, Topeka.

The Association of Agriculture Teachers elected as president, Mr. H. H. Brown, Manhattan.

The Kansas Industrial-Arts Association elected Mr. R. H Roberts, Winfield, as president, and Mr. H. A. Kersey, of Herington, as secretary.

The Kansas Printing Teachers' Association elected Mr. Ralph Graber, of Lawrence, as president, and Mr. Charles Winders, of Salina, as secretary.

The Kansas Vocational Association has a membership of 220 teachers. Under the forceful leadership of the new president, Mr. C. O. Banta, a forward-looking program has been planned and the association anticipates large gains in membership and an increase in usefulness to the vocational teachers of Kansas.—*W. W. Scott.*

## News Notes

**Revise Curriculum**

The department of education of the Province of Ontario, Canada, has undertaken a revision of the courses in high schools and in vocational schools which it is expected will be put into effect during the second semester.

A general course has been inaugurated, in which a fair proportion of both academic and vocational subjects are provided. This course is allied with the present matriculation course so that pupils who take it will not find themselves barred from the university if they should decide to enter it.

The curriculum, as outlined, includes obligatory subjects such as English, social studies, health education, elementary science, and mathematics. The new general course includes one language in addition to English. Included in the revised courses are such subjects as shopwork, household science, commercial work, agriculture, art, and music.

The new curriculum has not been prepared with the idea of any hard-and-fast rules. Individual schools have certain liberties regarding the subjects taught, and it is expected that changes will be made from year to year as the conditions demand. A wider range of training for teachers will be demanded as a result of the change.

**New Machine-Shop Course in Pittsfield**

The vocational department of the high school, Pittsfield, Mass., has added a new course in machine-shop practice, with Mr. William W. Monks as instructor. Approximately $20,000 worth of machinery has been donated to the department and $1,000 worth of supplies have been purchased for the use of the classes.

**Plan Enlarged Facilities to Meet Needs of Industry**

The board of education of Detroit, Mich., has begun plans for enlarging its school facilities and for widening the scope of technical and vocational training to meet the needs of industrial training in the city. The board has asked for $400,000 for new school buildings in its budget for the year 1937.

Wilbur Wright High School, which co-operates with industry, has an enrollment of 1,200 students and is facing a need for an additional story. The Cass Technical High School will have facilities for additional students with the opening of a new Western High School in the fall of 1937. All of the technical and vocational schools are badly in need of increased space, which means that new additions or new quarters will be needed for the two girls' vocational schools, the George Junior Trades School, and the Building Trades School.

The vocational department will continue its policy of providing related academic subjects for students specializing in industrial education. It will also offer vocational subjects to be given recognition by academic teachers and administrators with a view of guiding into the work such students as will make a success in the vocations studied.

# NECESSITY

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The fact that the U. S. Government allowed this patent proves that it is a NEW idea for doing inlaying quickly. Tedious tasks that formerly took hours with a knife or a chisel can now be done in a few minutes with this K & D hand routing kit.

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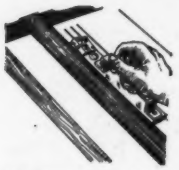

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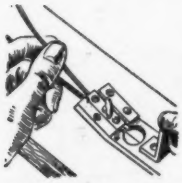

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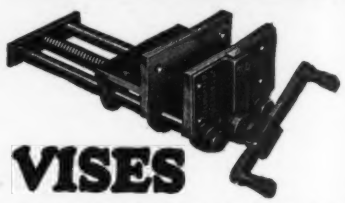

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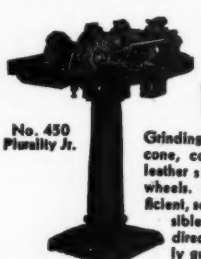


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Grinding can be done on a cone, coarse or fine oilstone, leather stropping or emery wheels. Unit is compact, efficient, serviceable, easily accessible and has ball bearing direct motor drive. Especially guarded for school shop use. Details on request.

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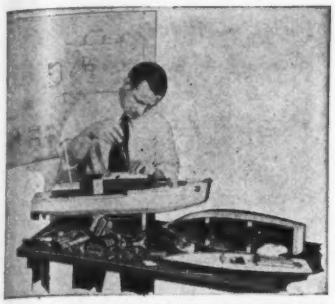

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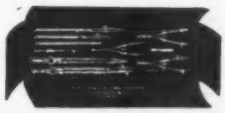

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# School-Shop Equipment News

## VOCATIONAL-GUIDANCE INFORMATION

The Commonwealth Book Co., Inc., 80 East Jackson Boulevard, Chicago, Ill., is marketing two series, A and B, of vocational-guidance monographs. Each series consists of 25 pamphlets filled with definite, up-to-date information on as many vocations.

The data for these monographs were collected by the Vocational Guidance and Educational Research Bureau which was established for the purpose of making vocational information available to the educators of America.

## NEW T-SQUARE

The U. S. Blue-Print Paper Company, Chicago, Ill., has developed a new T-square with a stainless metal blade constructed with strips of

celluloid along the edges. It is supplied in a regular T-square with the single head, also as a T-square with the double shifting head. It can also be obtained as a plain straightedge and as a straightedge cut with slots for use with parallel attachment to drawing table.

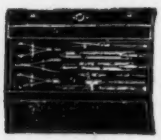
This new T-square gives the assurance of longer life and less warpage than the old wooden T-square which it displaces.

## MR. PERRIGO RETIRES FROM E. C. ATKINS

Mr. S. M. Perrigo, who was formerly in charge of the Chicago branch of the E. C. Atkins Company, is retiring from active duty. Mr. Perrigo entered the firm in 1909, when he assumed charge of the Chicago office as a special representative of the hardware department. As a result of his excellent work and application, he was promoted to the position of manager which he occupied for a number of years.

Mr. Perrigo has been succeeded by Mr. O. H. Huebner, who was formerly a salesman for the E. C. Atkins Company, at Minneapolis, Minn.

# THE MARKET PLACE

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A complete line of Drafting Materials for Schools and Colleges
*Let us quote your requirements*
**United States Blue Print Paper Co.**
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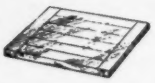

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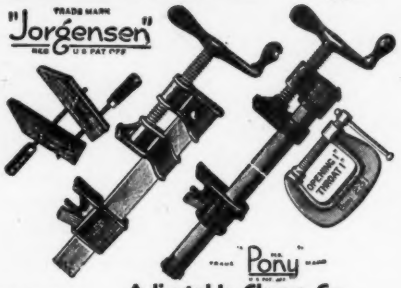
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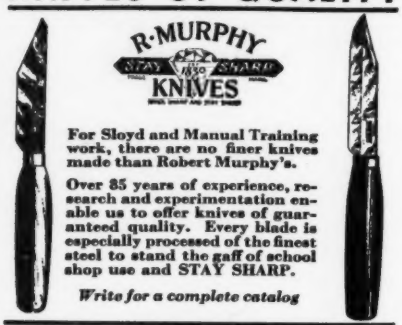
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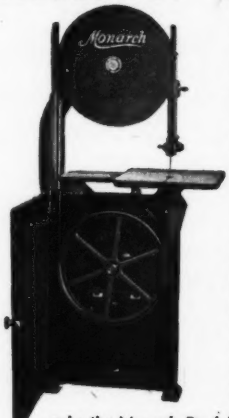

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